dBASE ON UNIX

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APRIL 1991

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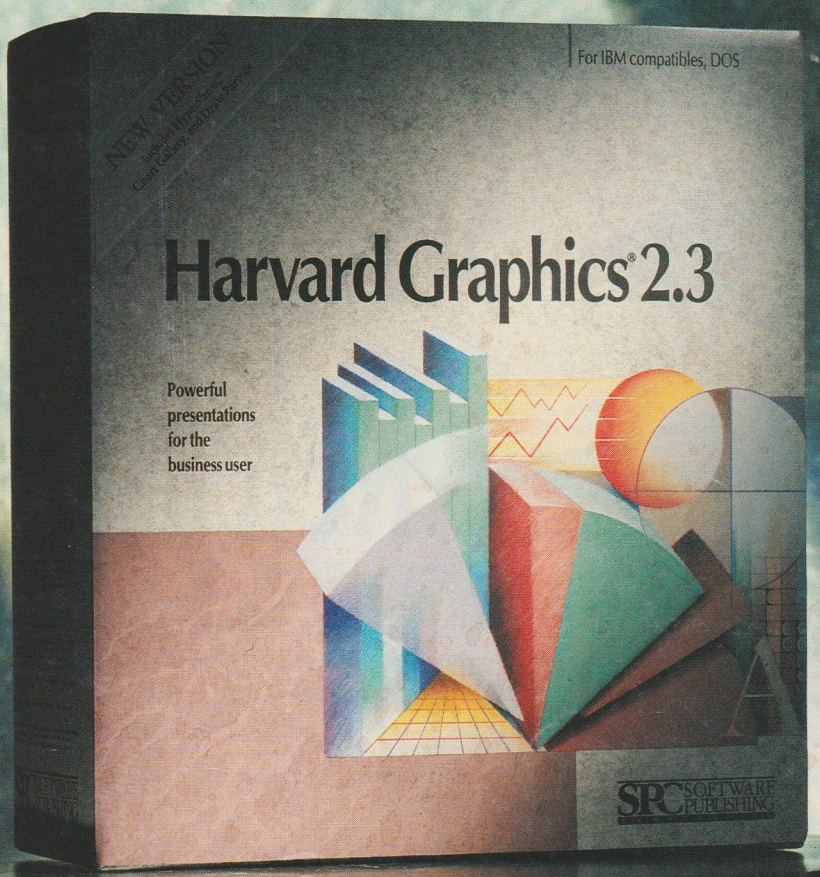

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- Z/Max bulletin board
- Artisan paint program

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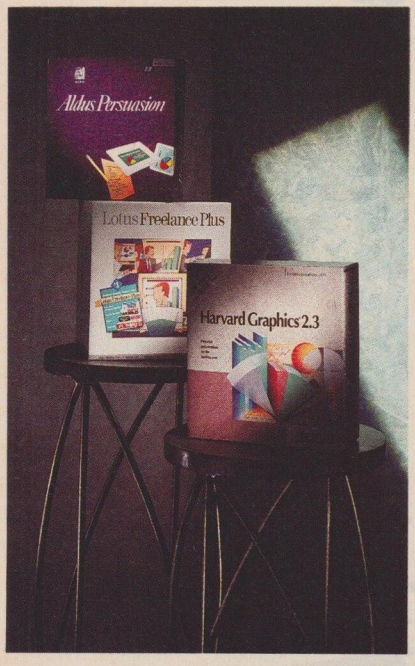

The best-selling business graphics packages in the United States–Aldus' Persuasion, Lotus' Freelance Plus, and Software Publishing's Harvard Graphics–don't run on UNIX. What's worse, none of these vendors is currently developing UNIX versions. Why not? See page 54. (Cover photograph by Mark Johann.)

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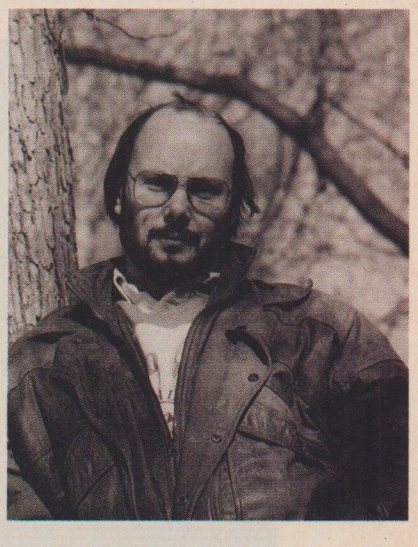
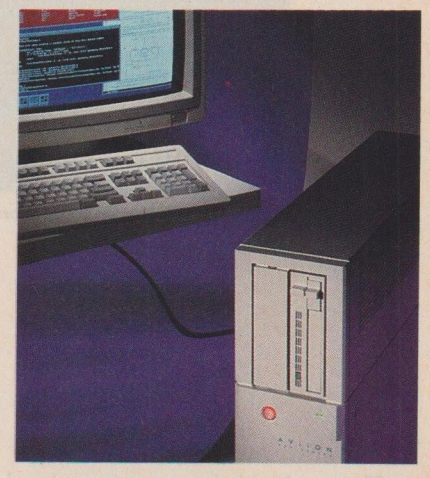


Top: *The woods around his home in New Jersey often remind Bjarne Stroustrup of his homeland in Denmark. For an inside look at the inventor of C++, see page 47.*
Bottom: *Data General's Aviion 402 targets the company's existing customers with an expensive dual-processor system. For our review, see page 81.*



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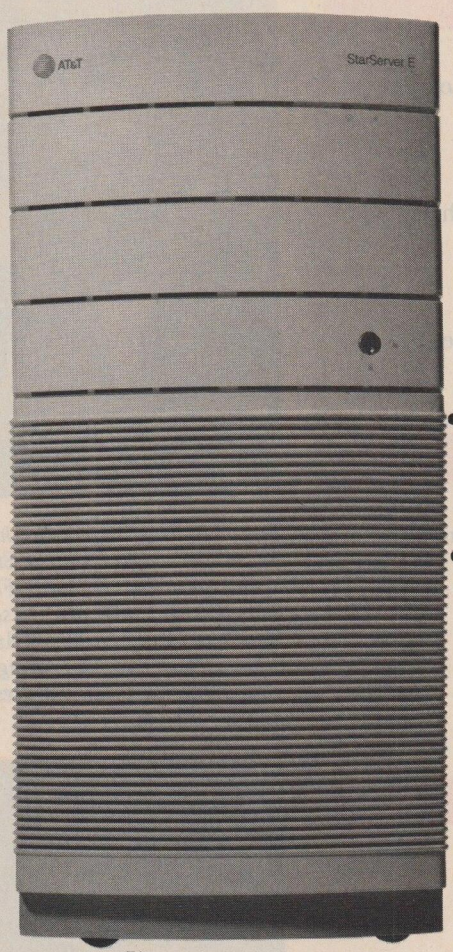

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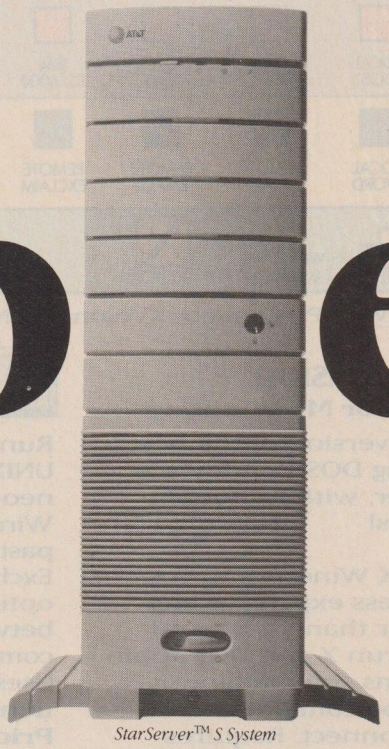

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System Bus Speed	33 MB/sec.	66 MB/sec.	267 MB/sec.
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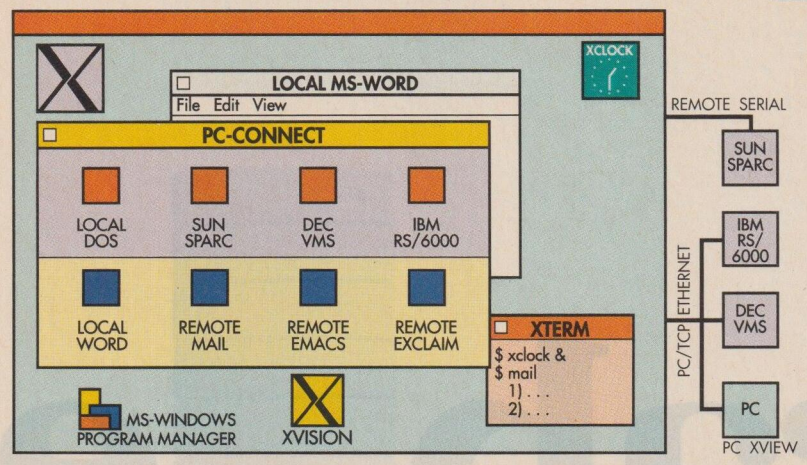

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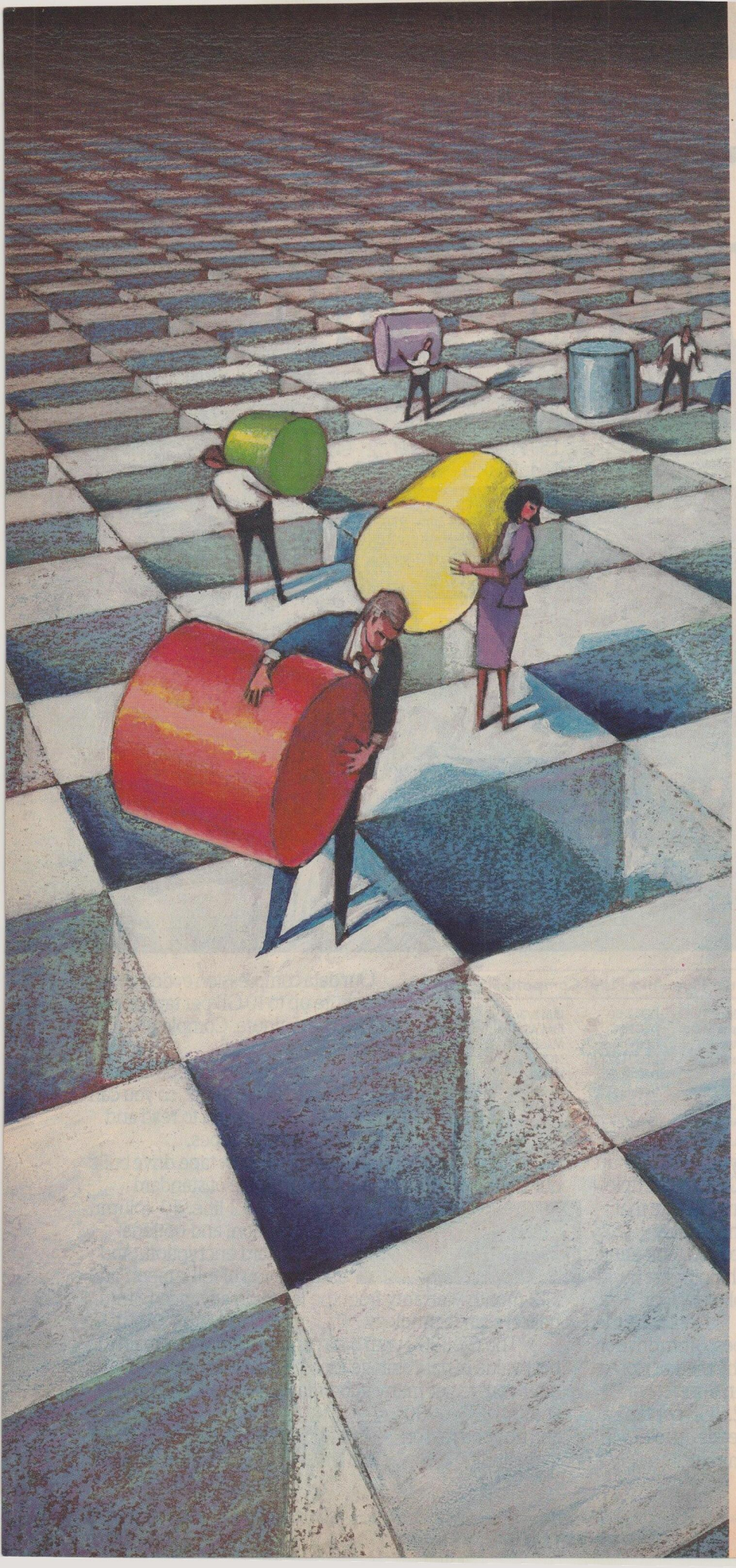

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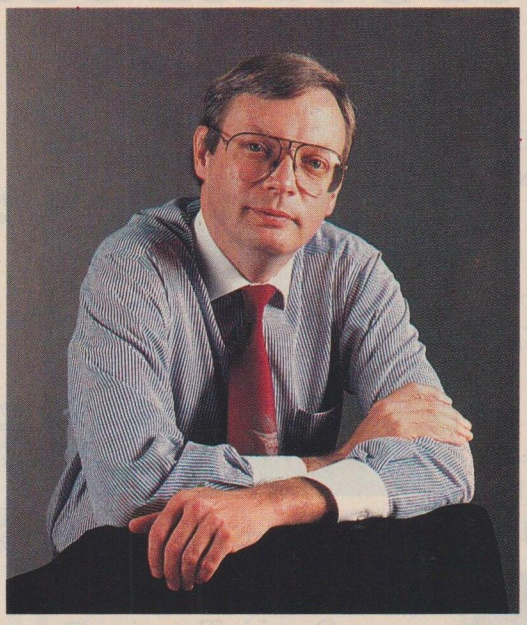

INTEROPERABILITY: A SPACE ODYSSEY?

At the height of the Cold War, the United States and the Soviet Union were able to join two spacecraft in space. Astronauts from each country shook hands, then separated and went their own ways. I use this event as an example of connectivity in contrast to interoperability.

Computers have been connected to each other to exchange data for decades. The concept, which I call connectivity, is simple by today's standards. Like the astronauts shaking hands and exchanging a few words in each others' language, the communication of data from one computer to another is a relatively simple implementation. For the astronauts to connect in space, engineers had to cooperate on the specifications for the spacecraft docking interfaces. For data communication, programmers must be able to create data and protocol interfaces.

What is so great about interoperability? If all you want to do is share data or exchange pleasantries in space, interoperability is overkill. But sharing resources–rockets, spacecraft, astronauts, tracking stations–means completely redefining your goals and terminology. Said another way, when even the richest nations realize the limitation of their resources, a mission to Mars or a permanent spacestation is more realistic as a cooperative international venture.

My definition of interoperability allows all the resources of a computer network to work cooperatively. The network does this transparently, without user knowledge of the physical location of files, or in some cases, even which computer(s) their work is being performed on. The word computer means just that–any computer on the network, from a PC to a mainframe. (I know I am as entitled to this definition as anyone because I consulted a number of industry experts. Each of them disagreed as to what interoperability meant, whether it could be defined, or even if it was important!)

If you don't find my space analogy convincing, you only have to look at the sorry state of what is called personal computing in large organizations. When more powerful software like Microsoft's Windows became available, it was virtually useless on the majority of PCs because each had to be upgraded to take advantage of it. Compare this with an interoperable network where resources can be added to either clients or servers, virtually anywhere on the network.

While we're on PCs and networks, it's clear to me that PC LANs are not particularly good examples of interoperability. Sharing resources such as files, printers, faxes, and the like is great, but a network that doesn't provide computing power as well as I/O and storage resources is only half a network solution.

Every major system vendor is talking about its plans for and implementations of interoperability. The standards required for interoperability are coming together in the Open Software Foundation's Distributed Computing Environment (DCE) and Sun Microsystems' Open Network Computing. We are beginning to see real products like AT&T's Rhapsody, NCR's Cooperation, Digital Equipment Corp.'s DCA–the list goes on.

Marc Schulman, an analyst with UBS Securities, attributes the downturn in the computer industry's fortunes over the last few years to two facts: vendors haven't given users what they want and users don't *know* what they want.

Now that system vendors are beginning to offer users interoperable network computing, all that remains is for users to understand that interoperability is not an idea from outer space. ■

Dave Fiedler

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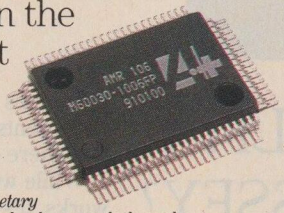

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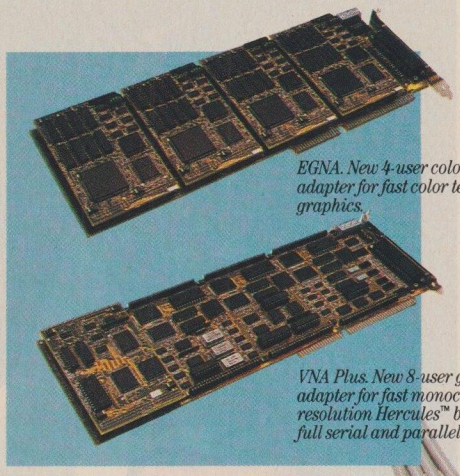

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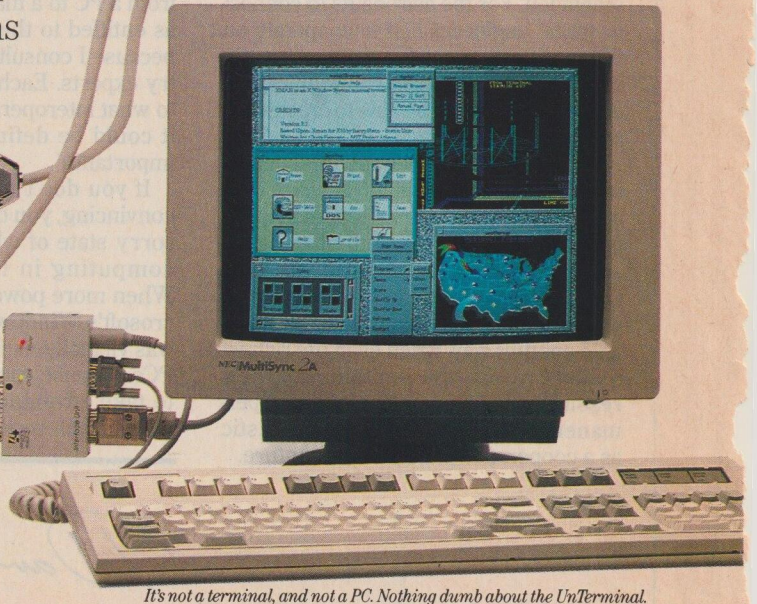

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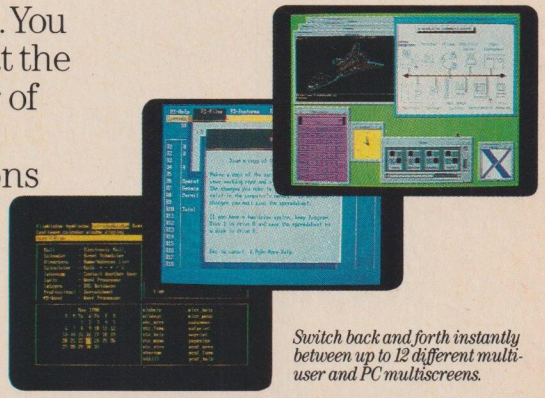

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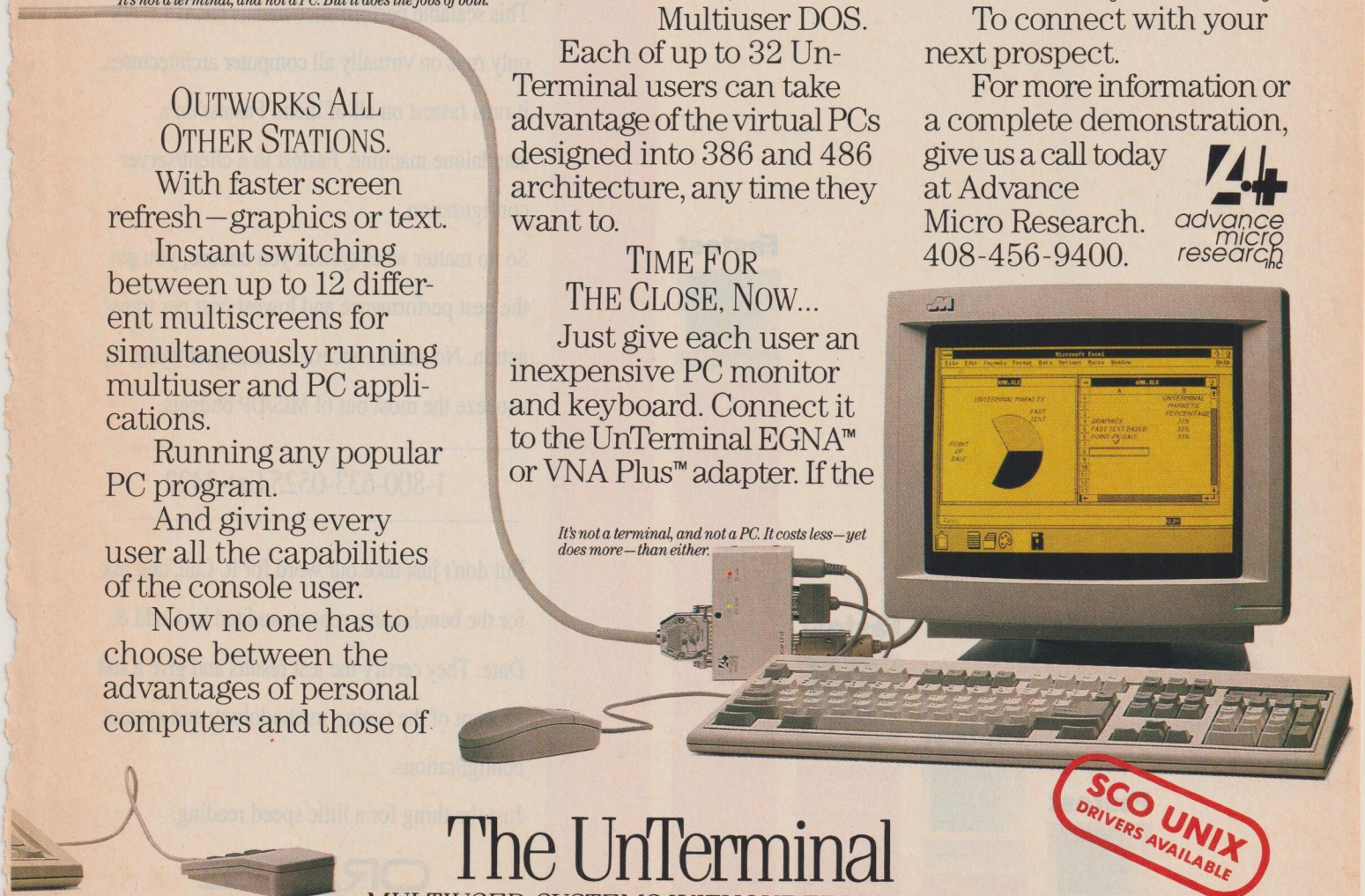

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OSF UNDER FIRE

The Open Software Foundation (OSF) is being investigated by the Federal Trade Commission according to a number of software vendors that were contacted by the FTC's Competition Litigation Division. OSF is being investigated for alleged anti-trust violations surrounding its request for technology (RFT) program, in which OSF members and non-members are invited to submit technology that will eventually result in a single, standardized product.

Rumors circulating in the press that a single disgruntled independent software vendor (ISV) initiated the investigation are false according to a number of sources. The rumors were that Netwise, a network development tools vendor, initiated the investigation. Netwise has complained publicly about the RFT process, but Netwise's Director of Strategic Relationships Larry Lytle denies the rumor. "Netwise never has, and never will, initiate litigation against the OSF," he says.

Several sources, who spoke on the condition that their names not be used, say many complaints have been filed by ISVs.

The FTC has been tracking OSF for two years according to one source, although the FTC "won't confirm or deny a non-public investigation," says Ron Rowe, director of litigation for the FTC's Competition Litigation Division. OSF President David Torey says the company hasn't been contacted by the FTC and is treating the allegations as rumor.

OSF is allegedly being investigated by the FTC for breaking the National Cooperative Research Act of 1984, which was aimed at stimulating research and development in businesses. The Act says that "joint research and development" isn't illegal *per se,* but will "be judged on the basis of its reasonableness, taking into account all relevant factors affecting competition."

In essence, when Congress passed the Act its goal was to recognize that joint research and development will encourage competition. It was also aimed at shunning the perception that anti-trust laws pose a threat to this type of venture. Yet OSF, say critics, is not a pure research organization, but a monopoly of major vendors (including Hewlett-Packard, Digital Equipment Corp. and IBM), designed to dominate the operating system market.

Although anti-trust lawyers contacted by UNIXWORLD refused to speculate about the outcome if the OSF investigation goes to trial, many of them said the legal climate is conducive to this type of investigation because the Bush administration is willing to push these cases to trial. The National Cooperative Research Act was signed into law by President Ronald Reagan on October 11, 1984, in an era when anti-trust lawsuits were frowned upon by the Executive branch.

Julie Rodwin, a senior research analyst with the Gartner Group, says she wasn't surprised when she heard about the investigation. "Many of the ISVs have expressed displeasure about the OSF," she says. "They're upset because it 'just so happens' that nine out of 10 times the OSF chooses member companies [in the RFT process]. There's a lot of incestuousness going on there."

RS/6000 IS A BILLION-DOLLAR BUSINESS FOR IBM

IBM shipped 25,000 RISC System/6000s in 1990, making its workstation business into a $1 billion revenue source, says C. Michael Armstrong, chairman and president of IBM World Trade Corp.

continued

"The success of the RS/6000 is the big surprise of the early 1990s," says Marc Schulman, vice president of UBS Securities, in a recent report. "Because the RS/6000 is a planned–not an unplanned–big surprise, we expect that IBM's management will exploit it far more successfully than it exploited the PC."

Schulman says he wouldn't be surprised if the entry-level RS/6000 was to represent the initial merging of IBM's workstation and PC product lines. "If OS/2 can be layered on AIX, so can DOS," he says.

ONE FOOT IN THE GRAVE

Scott McNealy, Sun Microsystems CEO, must have one foot in the grave. Not so long ago he swore that the Motif graphical user interface (GUI) would be provided by Sun on Sun workstations over his dead body. Now, sources close to Sun's federal product division say that Sun is readying 4,000 SPARCstations running a third-party implementation of Motif, but one still licensed from OSF.

The ostensible reason for Sun's embracing of the rival OSF standard, instead of relying on its own Open Look GUI environment, is that federal contracts typically favor Motif. The switch in attitude notwithstanding, Scott McNealy is said to be in good health.

X/OPEN UNVEILS "OPEN SYSTEMS DIRECTIVE"

Can users tell vendors what they *really* want? If X/Open has its way, they may get their chance. Traditionally, the vendor-sponsored consortium has set priorities by taking a vote of its members, all of whom sell UNIX- or open systems-based products. But X/Open's 1990 market research report, "Open Systems Directive," polled both users and software vendors and found how much difference there is between what customers want and what vendors think their customers want.

As an example, after two days of working closely with users, software vendors rated availability of applications as the most important issue for customers. But that ranked almost at the bottom of the users' list of priorities according to the report. Vendors also seriously underestimated the importance to users of systems management, security, communications, and interoperability between open systems and mainframes.

The result: X/Open says the 1991 market research effort will be in the hands of a professional market research organization, the Toronto-based DMR Group, Inc. This year's effort is also targeting large groups of corporate users. Approximately a dozen major open systems corporate user organizations will be invited to participate, including the User Alliance for Open Systems and other groups that are part of the Corporation for Open Systems, the Petroleum Open Systems Corporation, European Telco Information Services, Computer Users of Europe, and X/Open's own User Council. This means that, instead of the fewer than 100 customers surveyed in the past, this year X/Open will talk with 350 to 400 corporate users–and no vendors.

INTEL TRANSFERS SVR4 CUSTOMER BASE TO INTERACTIVE

The dark hotel suite brightened with flashes of light from the photographer's camera. The men–Dennis Peck, president and CEO of Interactive; Larry Dooling, president of UNIX System Laboratories (USL); Peter Cunningham, president and CEO of UNIX International (UI); and Ron Whittier, vice president of marketing for Intel–gave speeches. They took a group photograph. Yet the people that this press conference was designed to impress–journalists and analysts–seemed puzzled by the scene.

"I'm still unclear on the impact of this announcement," says one analyst, echoing the typical reaction to this press conference.

The joint agreement takes Intel away from the shrink-wrapped UNIX software business to concentrate its efforts on creating a standard Application Binary Interface (ABI). Intel

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announced it would transfer its existing UNIX System V Release 4 software customer base to Interactive. Intel will continue to support the Intel System V iABI efforts and its joint development work with USL for Intel architectural support in UNIX System V. Interactive hopes that large corporations will move toward SVR4, but analysts are unsure of Interactive's ability to sway the Santa Cruz Operation-dominated market toward SVR4.

USL will supply Interactive with a standard System V Release 4 base product, complete with coding, integration, quality assurance, and documentation, according to spokespeople from both companies. Interactive will market, package, sell, and support System V Release 4 for Intel-based platforms. "We were competitors before," says George Meyer, director of marketing at Interactive, referring to Intel. "Intel is moving out of the standalone UNIX business. This agreement aligns our strategy."

But the impact of this release will not be felt for months (if at all) because of the uncertainty surrounding user acceptability of SVR4, say analysts. SCO has not committed to SVR4. Representatives from SCO say they are "unconcerned" about the Interactive announcement. SCO holds about 80% of the worldwide market for packaged UNIX that runs on 386- and 486-based computers, according to International Data Corp.

UI RELEASES ROADMAP

In what some analysts see as a reaction to OSF's lauded distributed computing environment (DCE), UI has released its second UNIX System V Roadmap, which highlights plans for its distributed computing strategy. A companion document outlining a fully defined distributed computing architectural framework will be made available in the second quarter of 1991, according to Peter Cunningham, UI's president and CEO. UI's DCE is reportedly a superset of OSF's DCE, but a spokesperson for UI wouldn't comment because the architectural framework is currently being defined by UI.

UI's roadmap–the requirements planning process guide used by UI members to design future System V releases–focuses on two other areas: corporate hub computing and desktop computing. Corporate hub computing–transaction processing and multiprocessing–will be architecturally defined this year. In late 1991, UI plans to further its desktop computing strategy by incorporating an application programming interface supporting OpenLook and OSF/Motif.

SLIP SLIDING AWAY

Unisys Corp., which gets approximately 5% of its revenue from UNIX-based systems, has had another disappointing year. It continued to tumble financially with a net loss of $437.7 million on revenue of $10.11 billion for the year ended December 31, 1990. (Unisys reported a net loss of $88.5 million for the fourth quarter ended December 31, 1990.) A soft economy, a huge debt, and industry pricing pressures were the primary factors contributing to Unisys' problems, according to James A. Unruh, Unisys' chairman and CEO who, in classic understatement, called 1990 a "disappointing year for Unisys."

"Unisys has made some moves into open systems, especially on the software side," says Julie Rodwin of the Gartner Group, "but they are saddled with so much debt that they're going to experience continuing difficulties."

HP BUYS 10% OF INFORMIX

In a move that is becoming common with large UNIX vendors, HP and Informix Corp. announced recently that the two companies have signed an agreement where HP will acquire up to 10% of the common stock of Informix. (HP made a similar agreement with Ask/Ingres last year.) Under the equity-investment agreement, HP will purchase up to

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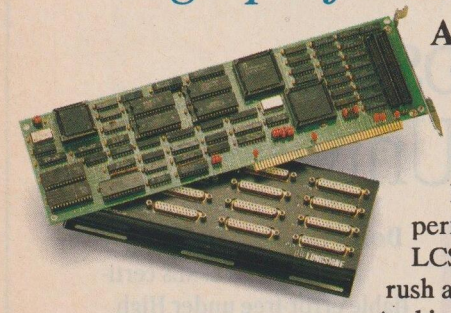

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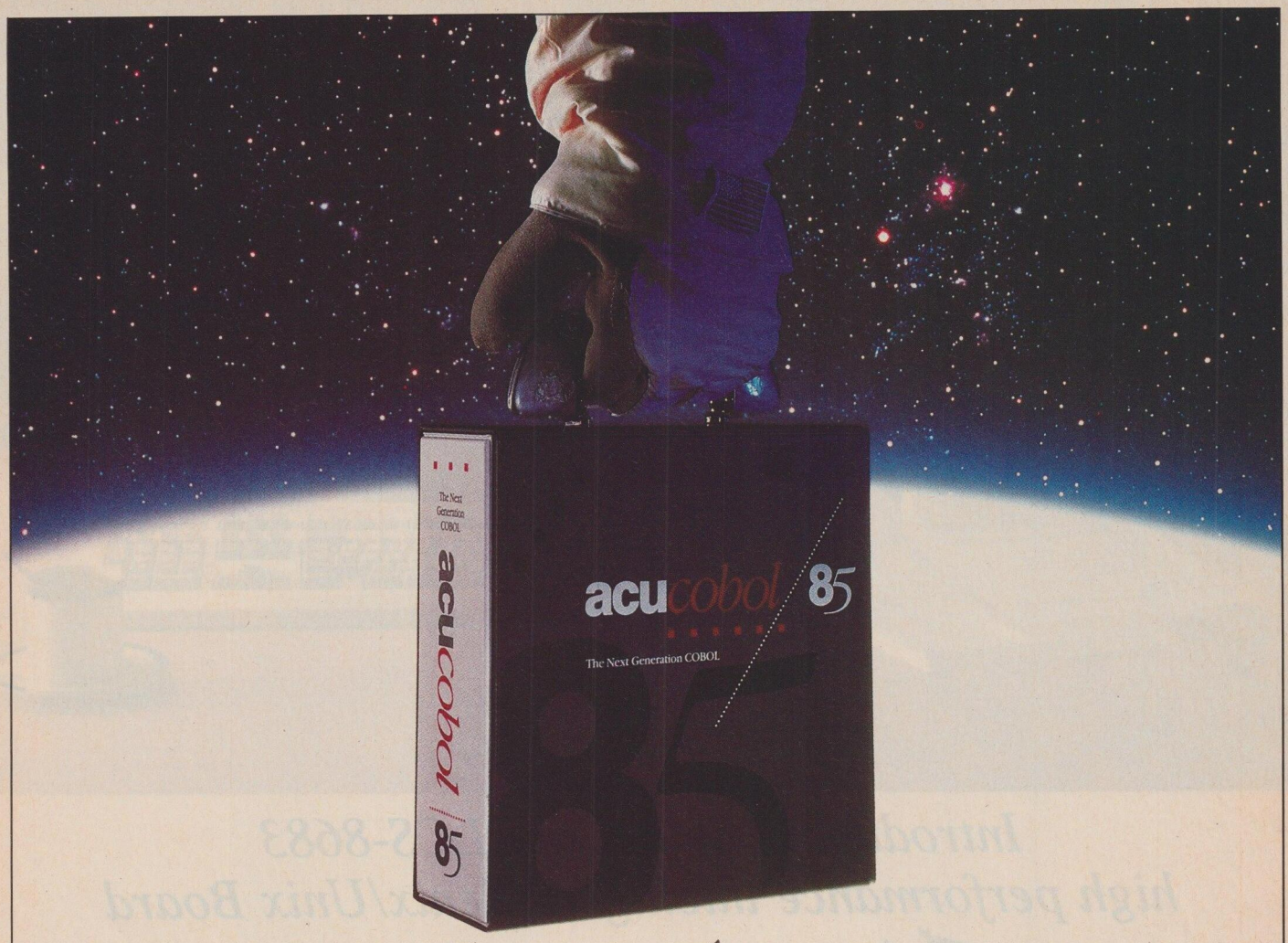

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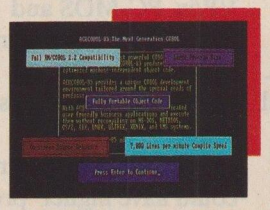

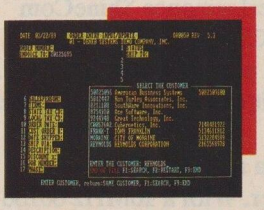

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a 5% equity interest in Informix on the open market between April 17, 1991, and February 4, 1992. The two companies also signed a five-year agreement for joint development, marketing, and sales.

"This is a formalization of an agreement that's been around for a long time," says Bernard Guidon, general manager of HP's General Systems Division.

Under terms of the agreement, HP and Informix will participate in joint activities to develop higher-performance products, says Guidon. The first result of this joint development is the Informix OpenCase/ToolBus, a new product based on SoftBench technology from HP.

"This is a big brother deal," says Elliot Prince, a vice president at Needham & Co., an investment firm. "HP is helping Informix as a cash, marketing, and development partner. Essentially, HP is giving Informix a vote of confidence."

Last fall, HP named Oracle to the "top-tier" of its preferred vendor program, but an HP spokesperson says this deal "won't affect Oracle because of the multivendor nature of customers."

ALTOS RELEASES FIRST MACHINES SINCE MERGER, BUT OVERALL SALES ARE FLAT

Altos has launched a new software company despite flat sales. The software company–ASP Express–will market, distribute, and support UNIX-based application and communication software for Altos Computers, says Ron Conway, Altos' president.

Conway says the first systems resulting from the Acer-Altos merger last July have also been released. Two new models from Altos' System 5000 line–the model 5820 and the 5000-33–and the Altos System 400 and 700 are targeted at small and medium-sized businesses with two to 16 users. These products were supposed to be announced in October 1990 at UNIX Expo in New York, but the announcement was pushed back until January 1991 because the products weren't ready to ship. Despite this delay, Conway is confident that the merger is going well.

Conway said Altos' "sales are flat right now," but attributed it to the soft economy.

UNIX TECHNOLOGY ADVISOR FOLDS

UNIX Technology Advisor, a newsletter aimed at UNIX technical managers has folded. The newsletter, which consisted of technical articles from vendors, ceased publication on February 1, 1991.

"We faced poor management," says Heinz Lycklama, senior vice president at Interactive Systems and chairman of the board for the newsletter. "The publisher was trying to sell it off and the management level [of the newsletter] seemed to drop."

88OPEN OPENS TEST CENTER

The 88open Consortium Ltd. and Thomson CETiA announced the opening of an 88open Certification Test Center in Paris, France, which will provide applications certification support and testing for ISVs porting to 88open's binary compatibility standards. The Paris Certification Test Center will be managed and staffed by CETiA, but will contain systems from several 88open member companies. For further details, please call Derek Meyer at 408-436-6600.

USERS HOLD MEETING

An organization aimed at fostering close cooperation among user organizations–the World Coalition of User Organizations–will hold its first meeting this year in Vancouver, B.C. from May 15 to 17.

The Coalition was formed at a meeting held during UniForum in January. It consists

of 14 open systems organizations including the Corporation for Open Systems (COS), the User Alliance for Open Systems, and X/Open. For more information contact Eric Bolton at 703-883-2755.

OVERHEARD

"We ship 10 copies of Lotus 1-2-3 for DOS every minute of the working day."—Larry Crume, vice president of international development, Lotus Development Corp. When asked how many UNIX copies ship, he replied, "Two or three a week."

"In the last six months, Microsoft has shipped more copies of Windows than there are UNIX licenses in the world."—Marc Schulman, vice president of UBS Securities.

Bill Gates, Microsoft Corp. chairman, on Microsoft's marketing strategy for MS-DOS and OS/2: "We're confusing the market, that's for sure. Not *intentionally*..."

Bill Gates on whether Microsoft will ever port applications to Sun's SPARC-based workstations: "It takes about a million machines to make something profitable for us." So when is that, next year? "Are you *kidding*? Where have you been?!"

Mike Maples, Microsoft vice president for applications, about to give a talk on Microsoft's applications strategy in a session that's already running more than an hour behind: "I don't see one person in the audience who hasn't already heard me give it (the applications strategy talk). It's the same. I'll take one question, and anybody else can talk to me at dinner."

George Shaffner, chief marketing officer, X/Open, on how things have changed in X/Open's most recent user survey: "Nobody's asking us to improve the Cobol standard."

Donald J. Boron, with Timkin Co.'s management information system department (MIS), on why MIS is slow to convert systems to UNIX: "We hardly ever convert something just for the sake of conversion."

An unidentified audience member at a session on standards at Usenix: "I'd like to make a comment about large installed bases. Arlington National Cemetery has a large installed base."

"GUI wars are noise. I have yet to figure out how to put a GUI on a cash register. And we have people in the back room who think you need to use D-CON for your mice."—Percy S. Young III, Burlington Coat Factory Warehouse's manager of store systems.

"It's no longer a scene out of the '60s. It's no longer a smoke-in." —Julie Rodwin of the Gartner Group on her impressions of UniForum. ■

—Edited by Gary Andrew Poole with staff reports. Please send any breaking news or comments to him at: `uunet!uworld!garyp` *or* `garyp@uworld.com`. *Or call him at 415-940-1500.*

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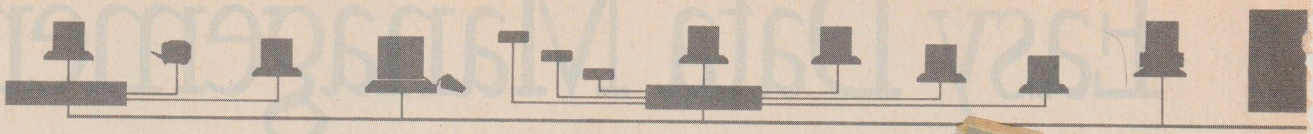

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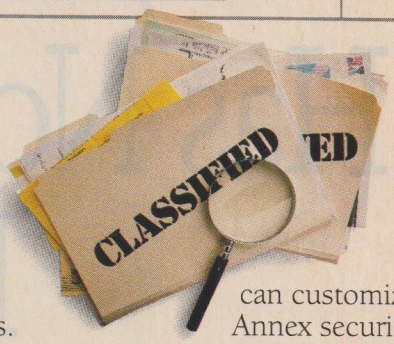

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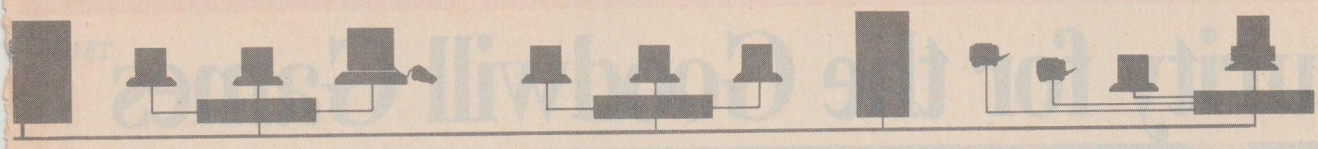

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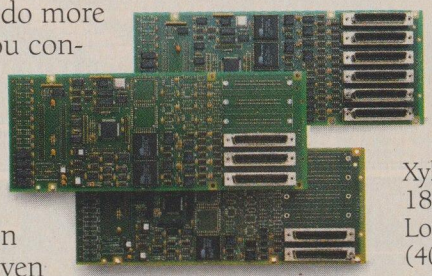

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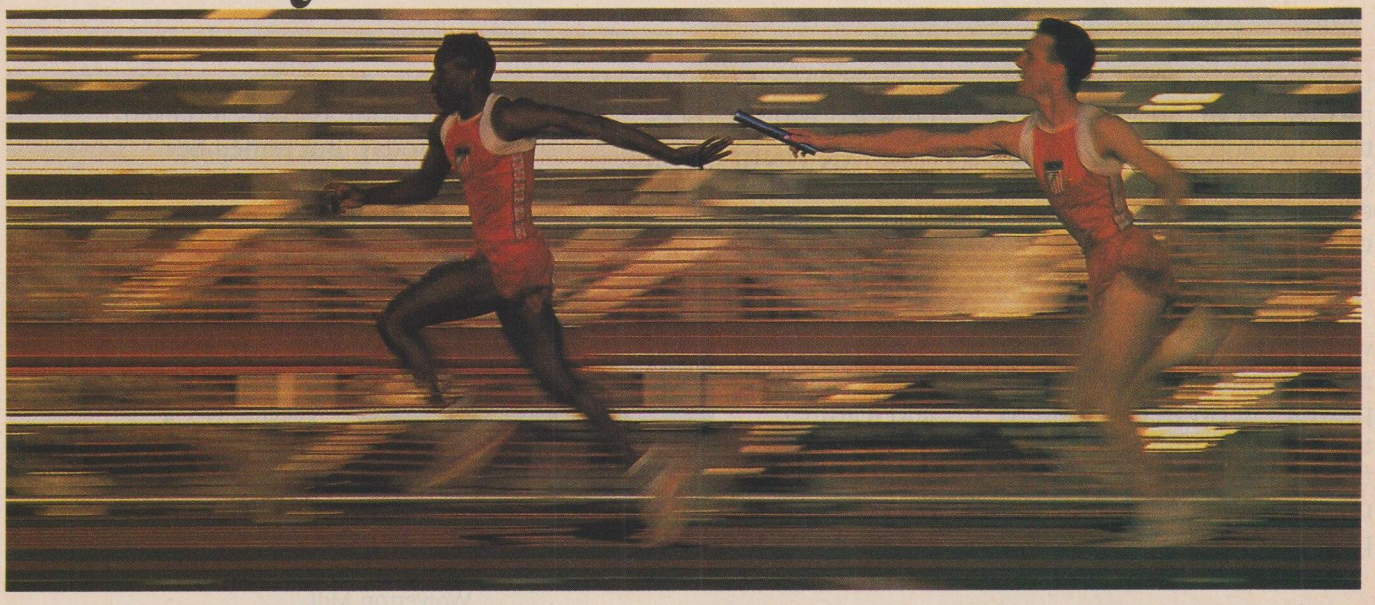
DBMS Case Study:

Security for the Goodwill Games™*



The Problem

The 1990 Goodwill Games: 2500 athletes in 22 events at 15 locations, drawing hundreds of thousands to watch them perform. A show-place for international goodwill. A potential target for terrorists. A challenge for security agencies.

With only 3,000 off-duty officers to fill 30,000 assignments, there's no room for confusion in scheduling. And scheduling must respond to last minute changes, as event times slip, as dignitaries arrive on short notice, or as threats arise. Hand-scheduling can't meet the challenge. But the Games' Integrated Police Planning Group (IPPG) found that no automated system had ever been developed for securing such events.

The Application

Automated Manpower On-line Scheduling (AMOS) matches personnel to scheduling requirements, taking into account special training, language skills, and other factors. AMOS prepares an assignment sheet for each individual, explaining the assignment, when and where to report, how to get there – even where to park.

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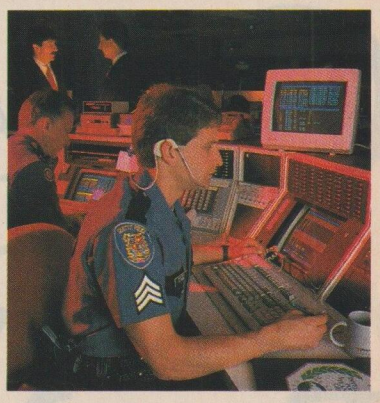

Command center personnel can adjust schedules without delay or confusion, thanks to db_VISTA III's ability to handle large volumes of data with speed and accuracy.

The Solution

AMOS was created by Raima's services subsidiary, Vista Development Corp., using the db_VISTA III DBMS. "We looked for months for a database that was fast, flexible, and could handle a huge volume of data while still maintaining speed," said Sgt. Alan Bernstein of the IPPG. "We also wanted to find a company that could not only furnish the product, but provide the development services." They discovered Raima and db_VISTA III.

Your end users may not be fighting terrorists, but they still need fast, reliable information to get their jobs done. If you develop applications for MS-DOS, MS Windows, UNIX, QNX, OS/2, VMS, Macintosh, and other environments, db_VISTA III is the solution.

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UW041

CIRCLE NO. 90 ON INQUIRY CARD

DISMAL FUTURE FOR THE UNIX DESKTOP

Dear Editor:

I found the "1991 UNIX Forecast" (January 1991), by Gary Andrew Poole to be most distressful. I have been a UNIX developer for about six years. I am a proponent of GNU, C++, Posix, X, and Motif. I am currently developing products for The Santa Cruz Operation's OpenDesktop and QuarterDeck's Desqview X. But, I now see a dismal future for UNIX on the desktop.

In my opinion, changes need to take place quickly or we had better learn to love Microsoft Windows. The Open Software Foundation and UNIX International should merge the graphical user interfaces and get on with it.

WYSIWYG interface builders are too expensive. MS Window interface builders can be had for $500 dollars for source code, while a comparable Motif WYSIWYG builder may cost $1,500 dollars. The industry should take a lesson from Next and give the WYSIWYG tool away to entice developers.

Software choices should be abundant and reasonably priced. Software should not cost half the price of your machine. Floating license servers should be the norm and not the exception. I applaud CrossWind Technologies, Quality Software Products, and Lotus for leading the way.

The desktop should be nimble and flashy. And, most importantly, software should be affordable. It's time for the big guys to put up or shut up!

Don R. Lyons
Arinc Research Inc.
Annapolis, Md.

Liars Figure and Figures Lie

Dear Editor:

While I enjoyed your 1991 UNIX Forecast in the January issue, I was reminded of the old cliche "liars figure, and figures lie" when I read the conclusions drawn from the pie charts in the article.

Although the charts on page 72 do indeed show that PCs and medium-scale systems will grow faster than large- and small-scale systems, it does not show, as you concluded, that, "large- and small-scale system shipments will fall." The actual annual growth rates of shipments in dollars for the different categories are: PC, 28.8 percent; Large-scale, 18.8 percent; Medium-scale, 29.0 percent; and Small-scale, 22.0 percent.

The growth rates are all fairly robust. In addition, the charts on page 74 do show strong growth for Windows, but, that growth all comes at the expense of MS-DOS. The combination of MS-DOS and Windows market-share actually drops from 90.5 percent in 1987 to 71.9 percent in 1994. OS/2 and UNIX seem to be the winners here. I just wanted to let you know that some of your readers really do look at the numbers.

Andrew A. Orr, Jr.
Director of Operations
Spray Products Corp.
Norristown, Pa.

Features Writer Gary Andrew Poole responds: You are right, the shipment in dollars is robust. But large- and small-scale systems are dropping in relationship to their overall percentage of worldwide UNIX shipments. Regarding the MS-DOS and Windows market dropping from 90.5 percent in 1987 to 71.9 percent in 1994, OS/2 and UNIX do not seem like "the winners" when they are projected to hold 21.1 percent of the market in 1994 to MS-DOS Windows' 71.9 percent.

A Clear Picture of Kodak

Dear Editor:

I was most impressed with the article about Kodak and Interactive in the January 1991 issue written by Michael R. Leibowitz.

Besides the thoroughness of the facts and figures, it was especially enlightening to realize Kodak's strategic vision of its state-of-the-art Photo CD technology merging with ISC's software talents. I wish to commend you for thinking of the subject, and Mr. Leibowitz for unfolding such sophisticated, multifaceted synergy of a $20 billion dollar company in layperson's language in order to paint a crystal-clear picture. Please continue this superb coverage.

Vik Vakil
Santa Clara, Calif.

Left DEC Off the List

Dear Editor:

Interleaf was thrilled that you chose our new product, Interleaf 5, as one of the January Top Ten products of the year. It is a great honor.

Inadvertently, however, the write-up in your December 1990 issue left Digital Equipment Corp. computers off the list of platforms Interleaf 5 supports. It runs on both Ultrix and VAX systems. We–and the substantial community of DEC users–would appreciate if you could publish a correction.

David Weinberger
Director, Strategic Marketing and Communications
Interleaf
Waltham, Mass.

RS/6000 Review Rises Again

Dear Editor:

Regarding your December review of IBM's RS/6000 as a server, I have no complaints about your benchmarks themselves. I wonder why you are only comparing the results to 386 and 486 systems?

Surely comparing the RS/6000 to comparable UNIX workstations would have been more helpful than comparing it to, say, a Vectra. While the fact that an RS/6000 can barely keep up with a 386 is scary, it would have been more useful to see how an RS/6000 stacks up against its real competition.

Michael Sullivan
Glendale, Calif.

Product Reviews Editor Alan Southerton replies: Our review tested two models: a multiuser/server, and a workstation. We compared the mulituser/server to our reference machine, a 386 system. We also compared it to a previously benchmarked 486 system after discovering that the RS/6000 was slower. By asking why we did not compare the machine to other workstations, you are overlooking the multiuser vs. single-user aspect of testing. In the review, however, we compared an RS/6000 workstation to a DECstation 3100 by using the SPEC benchmark.

continued

Pssst, IBM, Now Hear This

Dear Editor:

As UNIX moves into the commercial marketplace, we are seeing new types of users and programmers. They are not as astute as the first UNIX users, perhaps not even capable of writing the C "Hello World" program. In fact, if it were not for Foxbase, Informix, or other database systems, they would not be using the UNIX multiuser platform at all.

They may have their databases, but most often the program they use to convert their old files, manage odd jobs, and use as their general utility program is **awk**. Have you noticed the format in loading and unloading tables of any relational database system? All the fields are separated using an item separator, which is perfect for **awk**: $0 is the record, $1...$n are the fields.

This simple eloquent programming language is the perfect utility for modern databases on most commercial applications I have been associated with. As a consultant, I do not try to teach new customers C. I give programmers a basic course in **awk**. And yet, have you run **awk** on an Intel CPU without a coprocessor? I have. But not since I benchmarked a 286 with a 287/4 coprocessor and saw it outperform a 386 by 3 to 1. Since then, I have always recommended a coprocessor for all UNIX installations.

Which brings me to my main point: if we can justify floating-point hardware in the commercial marketplace for UNIX based on the use of **awk** alone, what is wrong with testing the performance of computers using **awk**? Neal Nelson is right on track with a benchmark in this area. Commercial users are not interested in mflops, dhrystones, linpacks, graphic 3-D monitors, C, or C++. They *are* interested in large sorts and **tar** commands that work in databases, and in **awk**.

Are you listening, IBM? Or are you really interested in confining UNIX to a single-user workstation market? Neal Nelson is more in touch with the mass UNIX market than anyone gives him credit for.

Jim Westrick
Senior Consultant
KPMG Peat Marwick
Wash., D.C.

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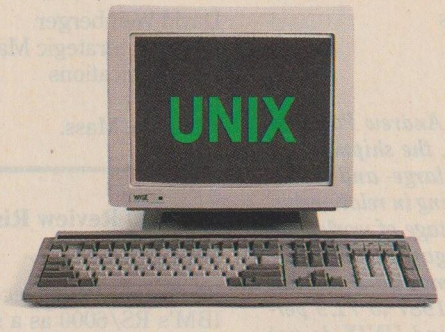

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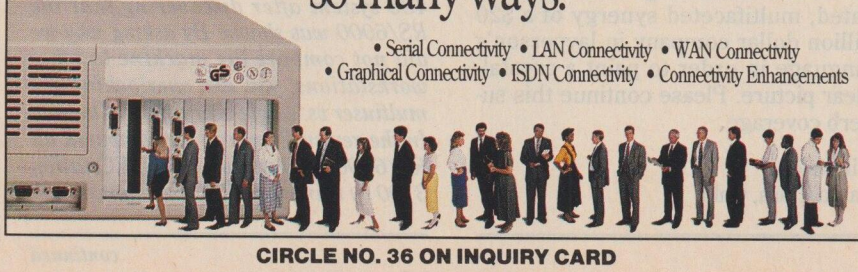

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CIRCLE NO. 36 ON INQUIRY CARD

Is PI Edit a Programming Editor or a Word Processor?

Dear Editor:

Thank you for the review of our product PI Edit in your October 1990 issue. I wish to clarify some issues.

Our product is a software developer's tool, designed specifically for that task. The reviewer based much of his evaluation on its merits as a word processor and his main complaint is that it has "few word processing features." In fact, the sidebar to the review is about a macro that makes up for PI's "deficiency" as a word processor.

Mr. Farris makes only passing comments on PI's merits as a software development tool–including its ability to integrate compilers and other tools into a cohesive development environment, language sensitivity, syntax checking, keyword prototyping, autoindenting and showmatch, and reconfigurability.

In the end, however, even the few features of PI that were discussed–cross-platform consistency, intuitive keyboard layout, multiple file editing, movement of text between files, "Find All," macros, and X Windows compatibility–and the language used to describe them are enough to recommend PI to nearly all professional developers.

Stephen M. Kuhn
President
The Iliad Group, Inc.
San Francisco, Calif.

Author Rick Farris responds: The UNIX workplace enjoys the luxury of having two excellent text editors available at no cost. For PI Edit to carve a niche in this market, it must be at least as good as **vi** *and* **emacs**, *as well as provide functional enhancements. Because* UNIXWORLD *readers are familiar with the UNIX standard editors, I did not try to cover overlapping areas of functionality such as integrated development environment and language sensitivity. Instead, I concentrated on the things that make PI Edit different. In particular, PI Edit is quite deficient in simple text-processing features (like wordwrap) that UNIX software developers have come to expect from their text editors.*

ADDENDUM

Geoff Morris, director of X/Open Co., was inadvertently omitted from the February cover story defining open systems. Here are his views:

"The technological basis for the open systems movement is as clear as it is simple–interoperability between systems, portability of software, and vastly improved ease of use. The freedom and flexibility this brings to an organization allows it to focus its time and energy on the critical information resource and on the distributed skills, creativity, and innovation of its people. That is the open systems value chain." ■

UNIXWORLD welcomes letters to the editor because your opinion matters to us. If you would like to comment on past articles or just voice your opinion on an issue, write to us at 444 Castro St., Mountain View, CA 94041, or send us e-mail at either of the following addresses: **uunet!uworld!letters** *or* **letters@uworld.com**.

All letters must include an address, and daytime and evening telephone numbers. Postal letters must be signed. We reserve the right to edit letters for clarity and space.

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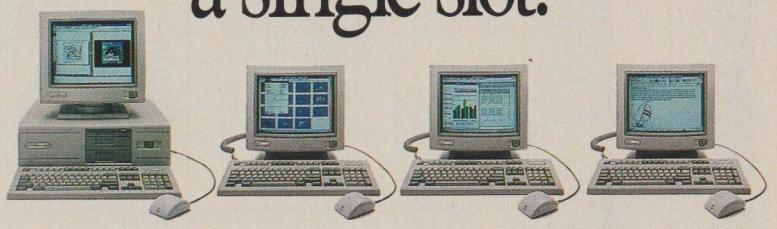

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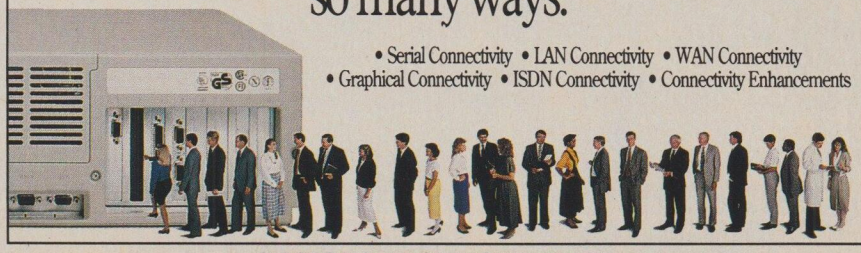

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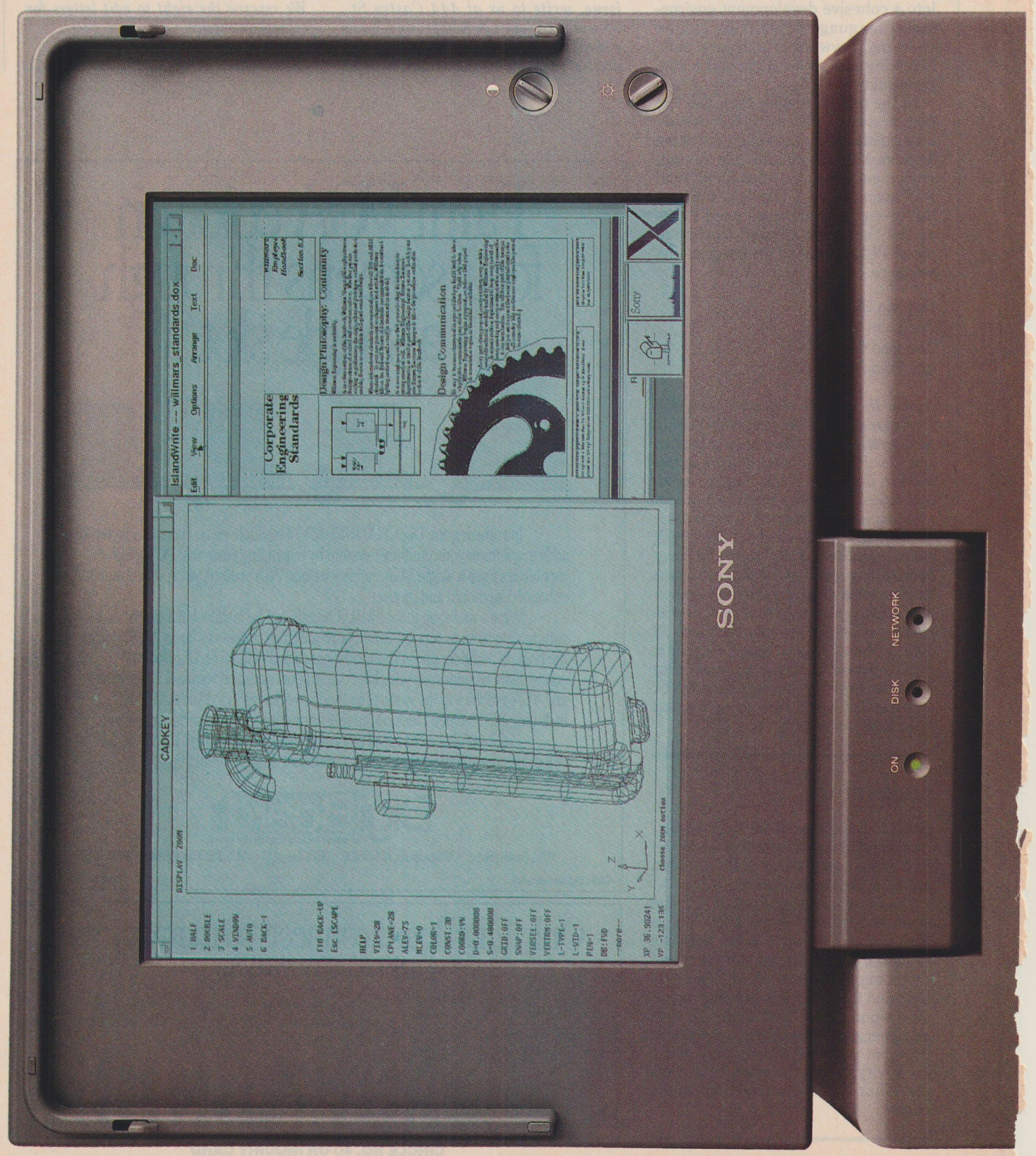

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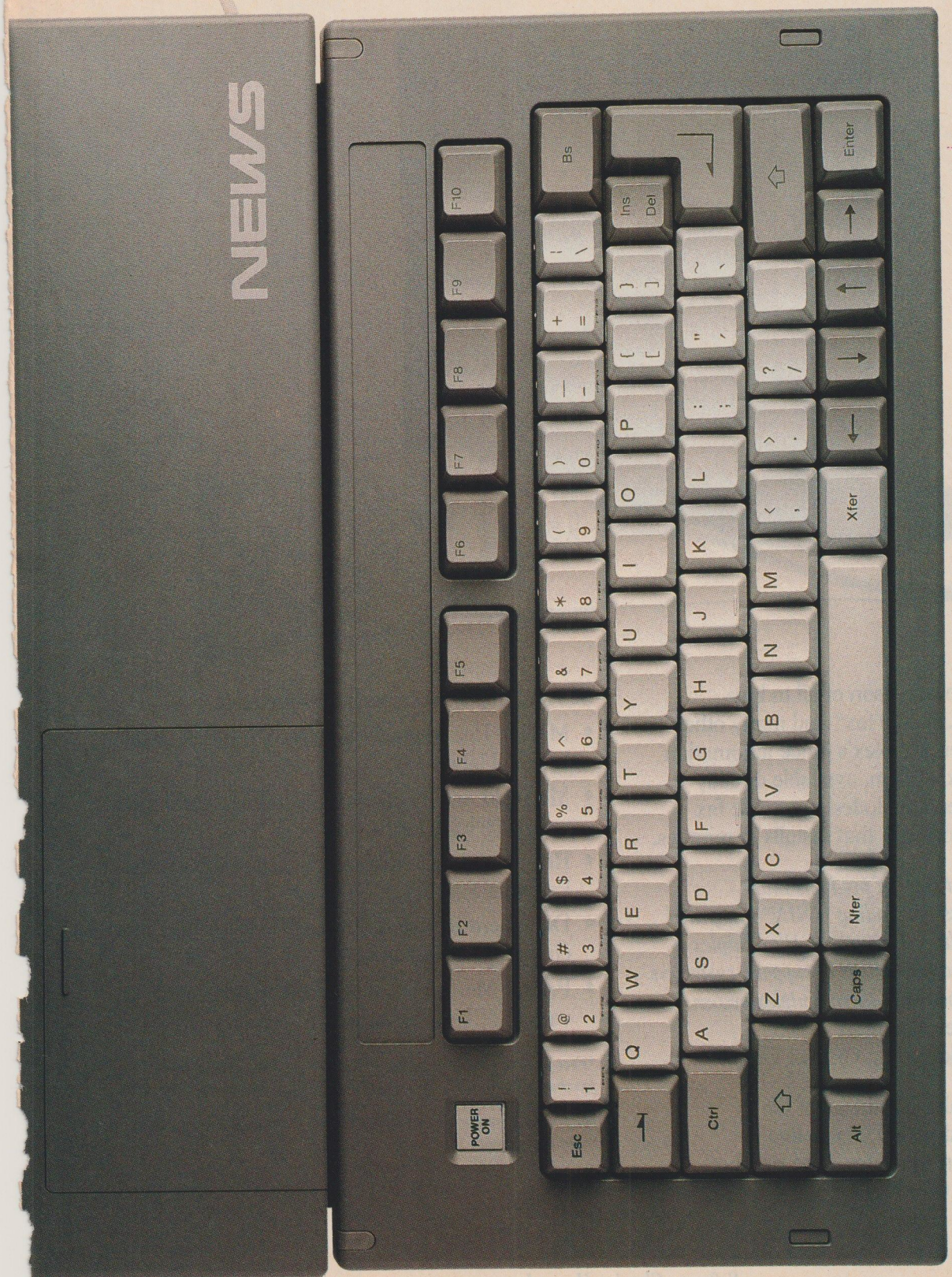

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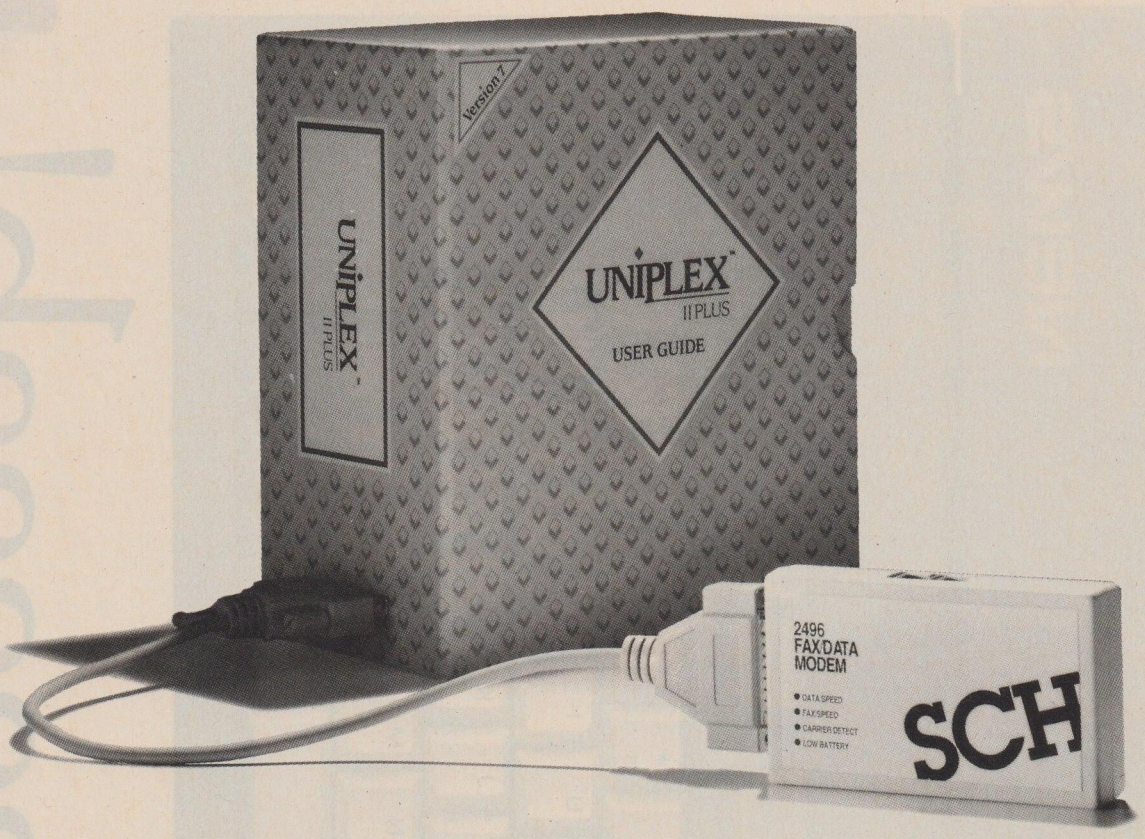

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CIRCLE NO. 107 ON INQUIRY CARD

Howard Baldwin

PROBLEM DIAGNOSIS BY REMOTE CONTROL

Imagine a *Jeopardy!* game for technologists. The category is System Administration, where an answer reads, "The request that gives system administrators the most exercise." A correct question to that answer might be: "Can you come show me why my terminal is locked?"

Maximum Computer Technologies (MaxTech) has devised a way to get UNIX system administrators off elevators, out of the halls, and back at their desks with its Remote Control software. Remote Control is essentially a software utility that, to use a long-distance telephone analogy, lets you "reach out and touch someone"–that someone being any user on your system with a problem on their terminal. You take remote control of the terminal so you can see the user's screen to determine what's wrong.

Other facets of Remote Control extend into monitoring, collaborative, and instructional uses. There are two main reasons to use it: productivity and productivity. It eliminates the time consuming process of getting up and witnessing the problem on the user's screen which may even be impossible if users are located in different cities. Second, Remote Control works better than the user trying to explain, by telephone or electronic mail, what's gone wrong. You can simply take a look for yourself.

Remote Control lets you manipulate the user's cursor with your own keyboard, diagnose the difficulty, and try different troubleshooting techniques without the user's input. If you choose to also speak on the telephone with the user, you can explain step-by-step what commands or keystrokes you're using to solve the problem.

Remote Control can be used on your own internal system, over networks, or over modems to tap into other terminals. It's designed to work with any terminal I/O board on systems running SCO UNIX or XENIX.

Because widespread networks frequently don't have the same brand of terminals, Remote Control also has a "terminal mapping" feature that lets a system administrator using a Wyse 60 terminal tap into a Digital Equipment Corp. VT100 and retain most of the functionality. "You'll lose some [functionality] because of keyboard constraints," admits MaxTech president Vincent Frese, "but most keyboards support the most general aspects of terminals."

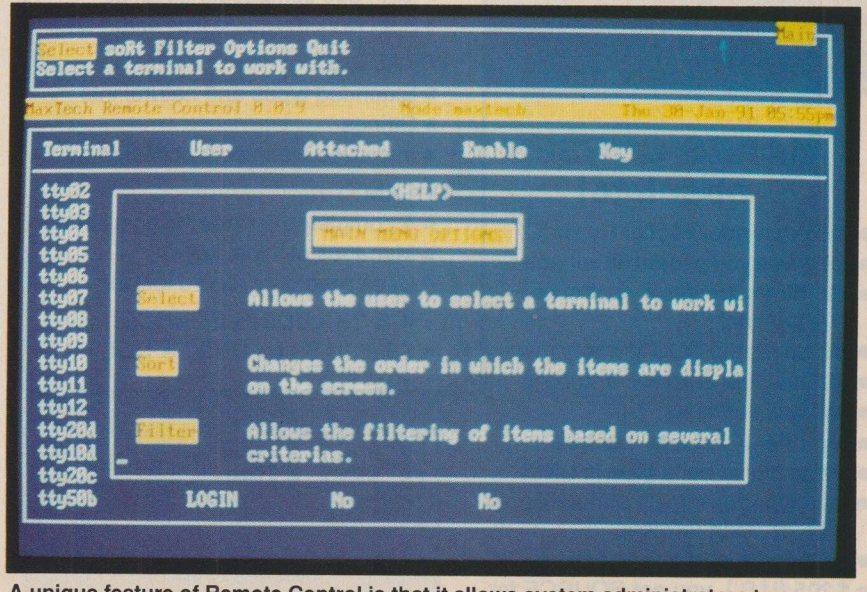
Uses for Remote Control extend beyond system administration, says Frese. For instance, colleagues working together on a project at different locations can bring up whatever they may be working on at each other's terminal simultaneously and communicate back and forth. Everything that is typed by each user on either keyboard will appear on both users' screens at the same time.

In the initial release of the product, the user who has tapped into the terminal retains priority over the screen. The second user would be locked out of his or her own keyboard while the first user was typing. In the second release of the product, Frese anticipates "more of a workgroup approach," with an improved "handshaking" method so that colleagues can exchange control of the screen as needed.

Two optional features of Remote Control that take it beyond the realm of simple troubleshooting involve the software's Monitor and Training modules. Setting up the Monitor module is akin to setting up a VCR to record a midnight movie. It lets you record the activity on a terminal when you're not around, schedule the date, time, and duration of the activity, and then "play back" the data.

The goal of the Monitor module is a noble one: to be able to take a snapshot of random events and study them more closely. This will be helpful for those annoying problems that may pop up when no one is looking.

On a less savory level, depending on



A unique feature of Remote Control is that it allows system administrators to remotely diagnose and troubleshoot problems occurring on another terminal.

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your view of system administrators acting as Big Brother, as in George Orwell's *1984*, the monitor module has other uses. It can also be used to record the productivity of users over a given period of time to ascertain whether they're working at maximum efficiency.

The Training module addresses educational situations. In this case, instead of a one-to-one communication between terminals, you can set up a one-to-many scenario. One teacher can instruct many students–even in remote

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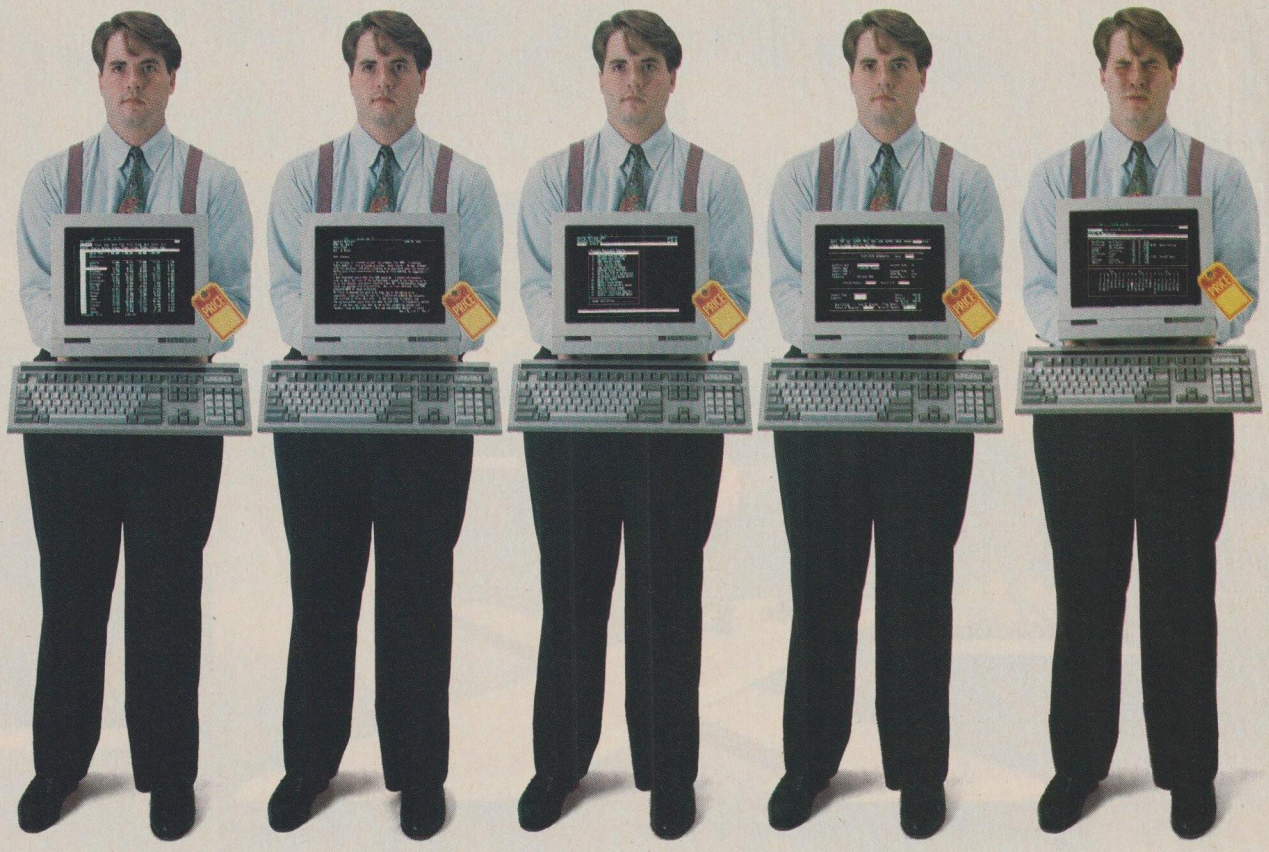

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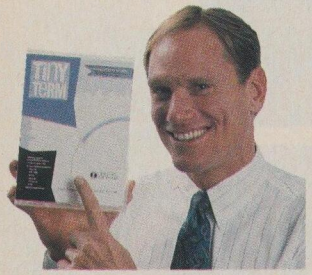

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CIRCLE NO. 65 ON INQUIRY CARD

Reviewed by Walter Zintz

GUIDES TO THE NET, INTERNATIONAL SOFTWARE, AND X

The menu is mixed this month. First is a guide to news on the Net, arguably the ultimate worldwide bulletin board for UNIX folks. The second review should interest both technical and business people facing the challenge of software for international distribution. Finally, a quick look at a brief executive overview of the X Window System.

NETNEWS REFERENCE MANUAL, SECOND EDITION

By Anatole Olczak
ASP; 800-777-8649, 408-629-7993
205 pages; 12 pages of Index & Content
ISBN 0-935739-18-1 paperbound; $19.95

Second Edition is a classic understatement. This volume is several times as thick as its predecessor and the information content has gone up proportionally. Explanation nearly equals reference coverage now, and the result is just about everything a user needs to know about news postings on that great worldwide linkage of UNIX and non-UNIX computers that's usually called just the "Net."

Anyone who knows the Net realizes that most of the information needed to use netnews is posted somewhere within the network. This truth doesn't reduce the usefulness of Olczak's book a whit. Hopeful beginners wouldn't be able to navigate the murky waters of the Net well enough to access these information caches. Anyone not yet at expert level will find the explanations in this book much more readable than the on-line instructions. The logically arranged and indexed format has to beat **grep**ping through miscellaneous files. Olczak's book doesn't replace the full on-line information–it refers the reader to online material at appropriate points–but Netnews is sweeter with the book in hand.

First among the four sections of this book is a guide to reading and posting. It assumes the reader is reasonably adept at using UNIX from a terminal, but starts at the bare beginnings of netnews. It's all easy reading for the serious reader, but not pablum. At the end, the reader will know everything essential about reading and posting, plus a few niceties like using a **.signature** file.

My one criticism of this book is that coverage of net etiquette is far too brief. Net etiquette is one of the biggest problem areas on the Net, and I'd really like to see more about it than a few paragraphs and a reference to the on-line material.

The second section deals with netnews system administration for local sites. Here the assumptions are that you understand a certain amount about overall system administration, and have general net-site administration under control. Beyond that, the writing is in everyperson's style, with explanations that are ample for those who think about what they're doing. For example, the various configuration files are covered in about half a page each.

The next quarter of the book is a quick-reference guide to the numerous commands, subcommands, and options that encrust Netnews. The style is logical and easy to follow for a general user who has read the first half of the book. If you've ever seen an ASP quick-ref guide in any field you'll recognize the style immediately.

The last quarter of the book contains listings of newsgroups, alternate newsgroups, and mailing lists (the last are tiny newsgroups). Net addresses are given for requesting admission to a mailing list and for submitting postings to moderated newsgroups. This section is subject to frequent changes, of course, but it's the place to look until you're skilled enough to check the latest information on the Net itself.

Review Highlights

Technical Level: Beginner to Advanced
Understandability: Lucid

Summary: Easy entry to what some call the greatest and loosest of computer bulletin boards.

DIGITAL GUIDE TO DEVELOPING INTERNATIONAL SOFTWARE

By Cynthia Hartman Kennelly
Digital Press (Prentice-Hall); 201-592-2000
381 pages; 23 pages of Index & Contents
ISBN 0-13-211228-0 paperbound; $28.95

Most American readers will be well into this book before they realize that it is about something that matters. Living in a nation that occupies a substantial part of a continent, and has long dominated the world economy, we rarely think about what foreign users want or need. Those of us who aren't completely convinced that our software is ready for international markets "as is" probably think that all it needs is menus, error messages, and documentation translated into a few foreign languages.

Not so, as this book makes amply clear. Foreign languages require foreign alphabets, for starters. Leaving aside the enormous problems in dealing with Asian iconographic languages, we still face European languages full of accented letters and a few special characters. When their special character sets are implemented, what will be the alphabetical order for sorting? Then, there are languages that read lines right to left, top to bottom, or in a combination of directions. Languages such as Hebrew have nothing equivalent to upper- and lower-case letters, and Arabic has four forms for each letter, depending on its position within a word.

Foreign style is just as troublesome. Formats for postal addresses, telephone numbers, dates, and times are obvious problem areas. Few programmers realize that such simple matters as writing a long number, or the "Dear Mr. Smith:" line in a letter, are also fraught with hazards. Hyphenation in foreign languages is a real terror. German, for example, often changes the

spelling of a word in order to hyphenate it.

When the reader realizes how demanding internationalization can be, this book is ready to help. It analyzes the requirements in a specific area, gives information that underpins the analysis, and shows actual examples of how one company (Digital Equipment Corp.) has gone about meeting the requirements. Throughout, the text frequently switches between sections that the most non-technical manager could easily understand, and explanations only a programmer could (or would want to) follow.

The examples from DEC are a major part of this book and arrive in three forms: DEC's model for internationalization; implementation under Ultrix; and (to a lesser degree) implementation under VAX VMS. Where appropriate, there are also examples using DECwindows–a version of the X Window System, which DEC co-developed. Anyone working under Ultrix or VMS shouldn't think of doing international software without this book. The rest of us can still profit from these examples–they show a systematic, comprehensive solution with ideas that are useful under any operating system.

The last major section of this book comes in the form of several appendixes: country-by-country listings of local formats and idiosyncrasies in areas like addresses, currencies, time, and such. This is the least successful aspect of the book. First, it's limited to Western Europe and North America. Asia is discussed in detail only in the lengthy discussion on using multiple bytes per character to encode the huge character sets used in countries like China and Japan. The rest of the world is generally ignored. Even in the areas covered, it is nowhere near complete. It couldn't be in a few appendixes. What information is given is usually not grouped by country.

Worst of all, the book has numerous mistakes. In the section on postal address formats, the author manages to give example addresses for Switzerland that are actually in Italy (complete with the country code for Italy) and addresses for Ireland that are actually in that country's mortal foe, the Northern Ireland colony of the United Kingdom. She leaves out the country codes for the Netherlands and Ireland while claiming they're included; leaves the county out of British business addresses and misidentifies the city as the county; indicates repeatedly that a personal letter to Switzerland should have that country's name in the locally spoken language while a business letter should have it in English; shows an address for West Germany that's missing the second section of the postal code–this list could go on. In data tables, mistakes like these are not easy to excuse.

Other appendixes give a list of ISO (International Standards Organization) standards, addresses of various standards bodies (none obviously undeliverable), a glossary, and still more technical minutiae. Despite this book's readability and the modest amount of code it contains, no one could dismiss it as lacking in technical content.

Review Highlights

Technical Level: Advanced to Expert, or Non-technical
Understandability: Lucid
Summary: A start toward serious thinking about making software marketable internationally.

BOOK BRIEFS

Non-technical managers and executives who have noted the exponentially increasing rate at which the term "X Windows" pops up in the press and conversations on computing may be wondering just what X is all about. Here comes Spectragraphics, a vendor in the field, to answer that question via a 20-page briefing. It's most suited to readers who are professionally computer-aware, but not especially computer-literate.

This introduction looks at such topics as why a standard network-capable windowing system is needed, what X does and (very lightly) how it interfaces to the rest of computerdom, and which way the X Window System may be going in the future. Particular emphasis is put on 3-D graphics under X.

X Window System: A Brief Guide To Understanding X Technology is free on request from Spectragraphics Corporation, 9707 Waples St., San Diego, CA 92121; phone 619-587-6969; fax 619-450-0218. ■

Editor-at-Large Walter Zintz is the Advisor Emeritus to Uni-Ops Books in Boonville, Calif.

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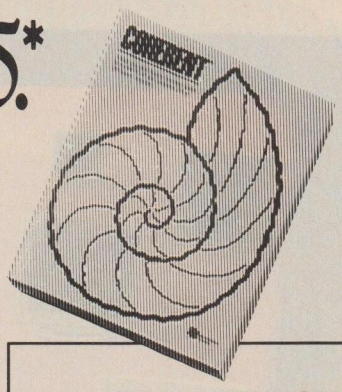

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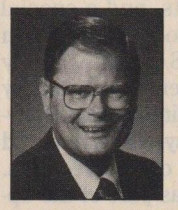

IMPRESSIVE NEW PRODUCT FROM OSF

Could the laggard Open Software Foundation come from behind and still win the UNIX wars? Once thought to be an improbable scenario, industry interest in OSF is intensifying. The unveiling of the Transarc transaction processing product, and the previously announced OSF Distributed Computing Environment (DCE) on which it is based, are a case in point.

DCE is promised for mid-1991, with some "developer's kit" components already released last October. Companies who have indicated support for DCE include Digital, Bull, Hewlett-Packard, Hitachi, Informix, Ingres, IBM, Microsoft, Siemens-Nixdorf, Sybase, and Transarc, among others.

The Attractions of DCE

To understand the attraction of DCE we need to take a closer look at its components. DCE is not a single product, but a collection of software packages and protocols that together create a standard environment for the development and execution of applications that utilize multiple, geographically dispersed computer systems. Elements of DCE have been gathered from a variety of system vendors and software suppliers.

DCE aims to provide a uniform, comprehensive, integrated set of services for applications regardless of the location of the user, the application, or the required resources. Perhaps most significantly, the entire DCE package is largely independent of not only the underlying network, but also of the operating system (or systems) participating in the network.

Key elements of DCE are grouped together as the DCE Executive. Additional services, known as DCE Services, are optional. Each computer system within the network must run at least DCE Executive.

The first key element of DCE Executive is the Remote Procedure Call (RPC). This software component is based on a scheme initially developed by Apollo Computer (now an HP subsidiary) as part of its distributed computing concept. As its name implies, RPC is a technique by which a procedure call (or subroutine jump) executed on a local system is transmitted to a remote system where the procedure is executed. Results are then transmitted back and presented to the application as if they were obtained locally.

This is achieved by creating "stubs" of code within the local application and remote procedure so that when the application calls the procedure, the stub is executed. The stub then issues calls to the RPC run-time support package, which in turn manages the communications with the remote procedure and its stub.

A special compiler (Interface Definition Language or IDL) allows application programmers to define the application-specific interface details. The IDL compiler then translates these into actual stubs. RPC nicely complements the increasingly popular idea of "client-server" computing, which could be implemented by having the clients (PCs or workstations) execute RPCs on the server.

RPC is one of two fundamental ways in which a client-server computing load could be distributed among several systems. The other is "function shipping" or "message passing," in which the application issues a request-for-service message to a server object providing that service. The system determines whether the server is local or remote and routes the message accordingly. The request is queued and executed by the server at its discretion.

It could be argued that the practical differences between the two techniques are small. The message passing technique, however, is philosophically more in tune with the increasingly popular idea of object-oriented programming. One disadvantage of message passing is that its overhead is present even when the server is local. An RPC, on the other hand, need only be invoked when the server resource is remote.

While the idea of the RPC is simple enough, its practical implementation entails many complex considerations. For example, to be truly useful, the RPC run-time support must provide for transport independence and transparency, allowing operation over a variety of local- and wide-area interconnect mechanisms and protocols. Different treatment must be given to procedures that may be executed repeatedly without ill effects (such as writing a person's new address in an employee file) vs. those that make incremental changes to a database (such as a procedure that subtracts $100 from a person's bank balance), and hence must not be executed more than once. Consideration must be given to recovery from a variety of network and server failures. These issues, and many others, have been addressed in the DCE RPC according to OSF.

Transarc Builds Distributed OLTP on Top of DCE

These capabilities are valuable in many environments; however, they are still not enough to support reliable distributed transaction processing workloads. Here is where Transarc Corp. comes in. This IBM-backed start-up is readying a collection of components, known as Transarc TP, to enable development, execution, and management of distributed, online transaction processing (OLTP) on DCE-supporting systems (see my January 1990 column for more details).

One of the key contributions of Transarc is the "transactional RPC," meaning the augmentation of the "plain DCE" RPC run-time package, as well as the IDL compiler, to support atomic distributed transactions. With the Transarc enhancements, RPCs embedded within a transaction boundary "understand" that they must keep the transaction context and track all nodes participating in it, so that the two-phase commit protocol, essential for assuring integrity of the transaction in case of network, node, or commit manager failure, can be automatically carried out.

Transarc is expected to release its basic product set sometime this year on four "reference platforms": IBM AIX,

SunOS, DEC Ultrix, and HP-UX. Beyond this, IBM indicated it will be adapting some of its key products, including the venerable CICS transaction monitor, to run with the Transarc TP set, on a roll-out plan spanning 1992-1993.

HP indicated that it will offer Transarc TP on both its HP 3000 and HP 9000 lines by mid-1992. HP plans to offer Transarc TP with both the MPE and UNIX-based HP-UX operating systems and to integrate Transarc TP with its own Allbase SQL database, as well as database products from Informix and Sybase. Stratus Computer, a supplier of fault-tolerant systems, says it will offer Transarc TP on its hardware platforms running either the proprietary VOS or the UNIX-based FTX operating system, beginning sometime in 1992. The variety of operating systems on which Transarc TP is scheduled to run is impressive indeed.

Of considerable significance is the support for threads offered by the OSF DCE. This facility, offered as part of the DCE Executive package, is based on the Posix 1003.4a Pthreads draft standard. Threads are "light-weight objects," meaning they can be scheduled much more quickly than a standard UNIX process because they all share the parent process' address space. More importantly, by allowing each process to have multiple threads, effective use can be made of any present hardware parallelism. Thus, in a symmetric, tightly coupled multiprocessor system, each of several threads from a single process may be executed concurrently, one per processor.

Support of threads is a key feature of Mach, the Carnegie-Mellon University-developed operating system upon which OSF/1 is based. But by offering this capability outside the kernel proper, DCE can be made to work on other operating systems as well. This user-level threads capability is based on the Concert Multithreaded Architecture (CMA), initially developed by DEC.

Distributed File System Adds Appeal

Much of the appeal of DCE is due to its Distributed File System (DFS). DFS is based on the Transarc yet-to-be-released Advanced File System Version 4 (code named Episode). DFS consists of several software components, and a special communications protocol, that rely on the RPC. Notably, DFS can use virtually any physical file system supported by the underlying operating system. However, the Episode file system is required to deliver the full set of DFS features. Episode is available as part of the optional DCE Services package.

DFS has several features designed to support distributed environments. To maintain data consistency, DFS keeps track of the data items cached on each node of the network. Such caching is essential for the operating efficiency of local nodes and is a crucial element of the client-server concept. However, local caching also raises the possibility that, as multiple nodes update their local copies of the data, incompatible versions of the same data items will be created. This problem is very similar to the "cache coherence" problem in multiprocessor systems.

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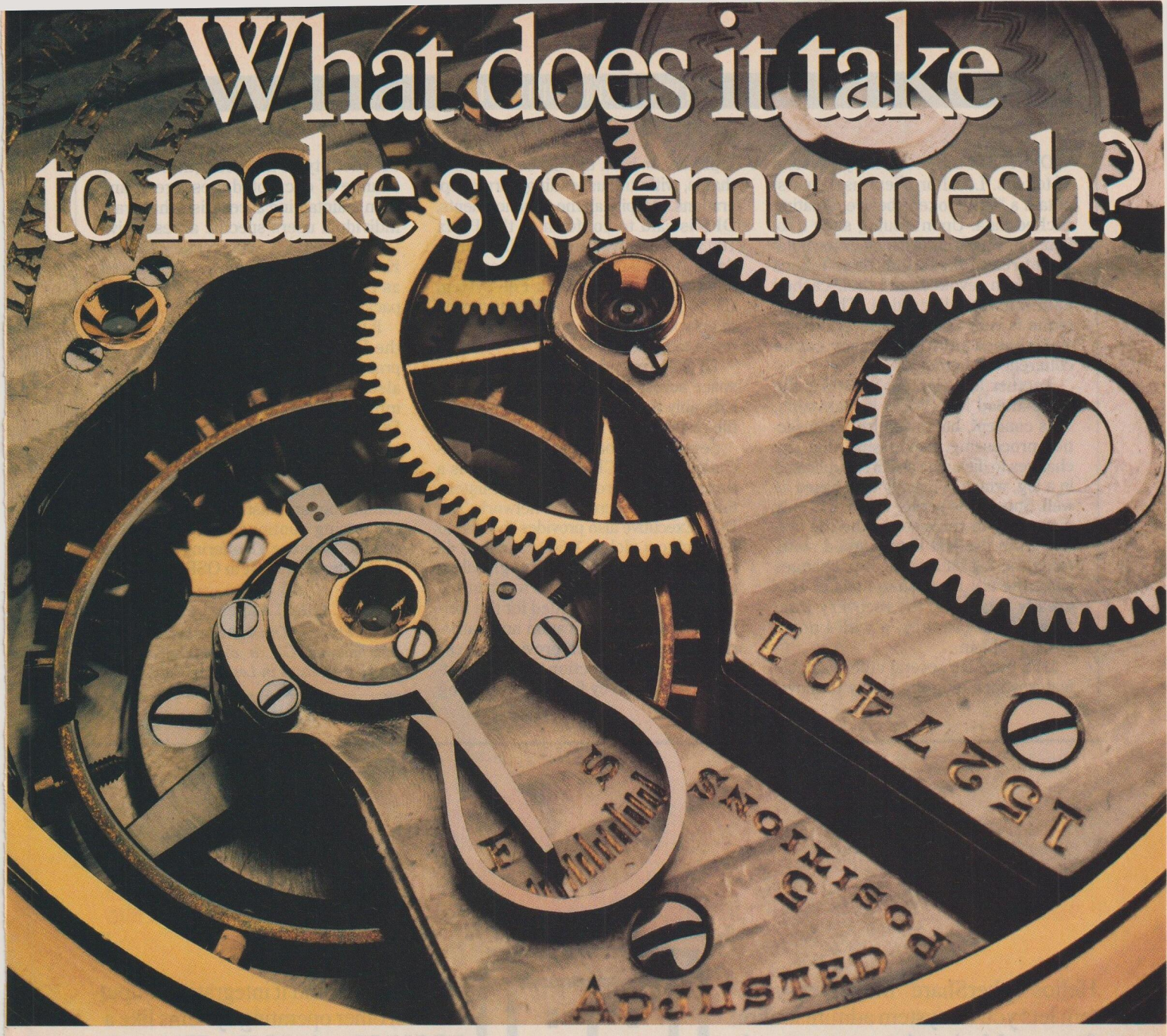

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DFS solves this problem by a system of tokens. Local or client users must obtain a "write token" before updating cached data. Upon issuing such a token, the server informs all other holders of read tokens that their tokens have been revoked, and their cached data must be discarded. This technique is very similar to several hardware-based multiprocessor cache coherence schemes.

Another key element of DFS is the write-ahead log (WAL) it maintains. This concept, borrowed from transaction processing, makes sure that any changes to disk data are first duplicated in a log, which is usually disk-based as well. Should the server crash, it is only necessary to reconstruct the file system from the last known good state, using the log data to recover changes since the last file system update. This greatly speeds up the recovery from file system crashes, a well-known UNIX problem.

DFS includes several other valuable features including the ability to move, replicate, or back up "file sets" on-line, that is, without suspending normal operations. Despite all the enhancements, DFS is said to conform to the Posix 1003.1-A file system semantics standard. It is also capable of inter-operating with Sun's Network File System (NFS), although this ability is viewed mainly as a migration tool to ease the move to DFS.

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It will clearly be some time before all the DCE components are realized as practical, well-integrated products. It is also worth bearing in mind that the most enthusiastic endorsements of DCE are coming from those key industry players who have contributed components to DCE. Still, as interest in distributed processing, client-server computing, and distributed transaction processing continues to mount, DCE and the Transarc TP offering could give a considerable boost to OSF. ■

Editor-at-Large Omri Serlin heads ITOM International Co., a consulting and research firm based in Los Altos, Calif.

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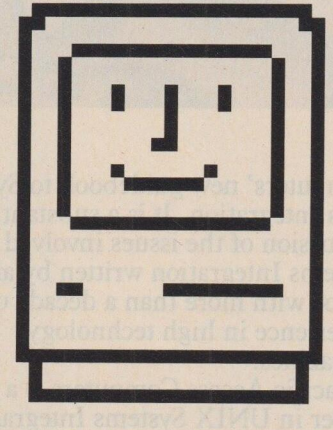

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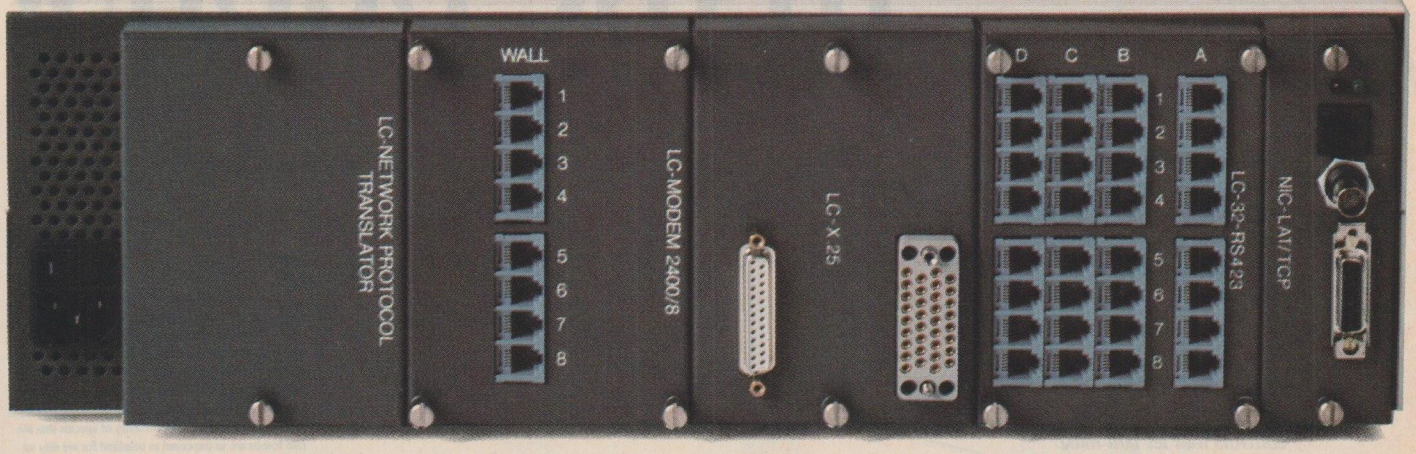

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chapter 15 THE DISAPPEARING RAIN FORESTS

Most tropical forests form a green band around the earth's center extending roughly 10 degrees north and south of the Equator. Amazing as it may seem, these forests occupy less than eight percent of the Earth's entire land mass, yet they account for nearly half of all the growing wood on the planet and are the home for two fifths of Earth's animal and plant species. It is because of the amazing diversity of species that the rain forests are so important to mankind for we rely on these for agriculture, medicine, and industry.

15.1 Natural Source of Products

At least a quarter of all pharmaceutical products are derived from tropical rain forests. An even more impressive statistic when you consider that less than one percent of all Amazon plants have been intensively examined for their medicinal properties.

Tropical rain forests have provided man with treatments for leukemia, Hodgkin's disease, breast, cervical, and testicular cancer as well as a wide array of analgesics, antibiotics, heart drugs, enzymes, hormones, diuretics, anti-parasite compounds, ulcer treatments, dentifrices, laxatives, dysentery treatments and anticoagulants. Of the 90,000 plant species in Latin America, only 10,000 have been tested for anti-cancer properties. Scientists expect that at least ten percent of the untested plants will reveal some form of anti-cancer activity. A species of alexa tree, found in the northern Amazon basin and Madagascar contains the plant alkaloid castanospermine which is being studied at St. Mary's hospital in London as a possible treatment for forms of AIDS.

Vast quantities of rubber from the rain forests provide such mundane items as tires, gum, and running shoes.

15.2 Thousands of Diverse Species

The rain forests are the most complex and diverse ecosystems in the world. A one and a half hectare of rain for-

Figure 15.1 From 1950 to 1975, the amount of the earth's surface covered by tropical rain forest declined 15% to 12%. It is predicted to decline to 7% by the year 2000, and to 4% by the year 2025.

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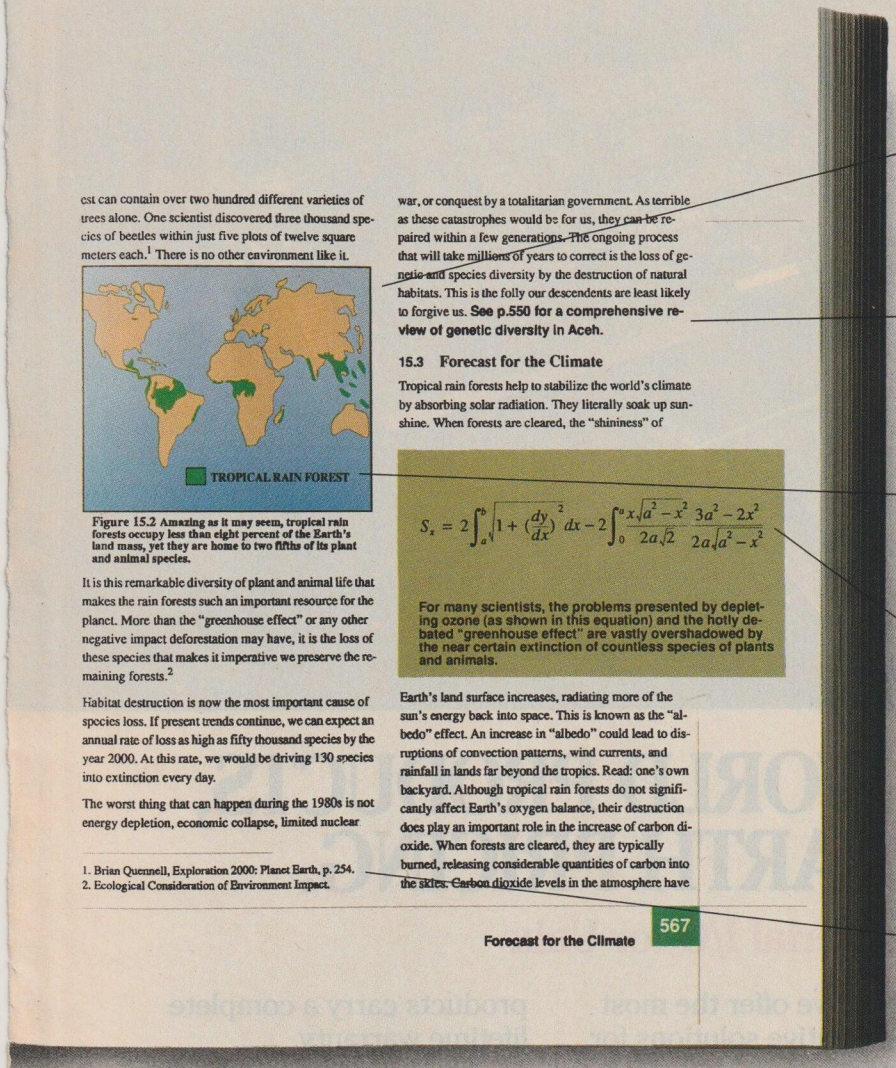

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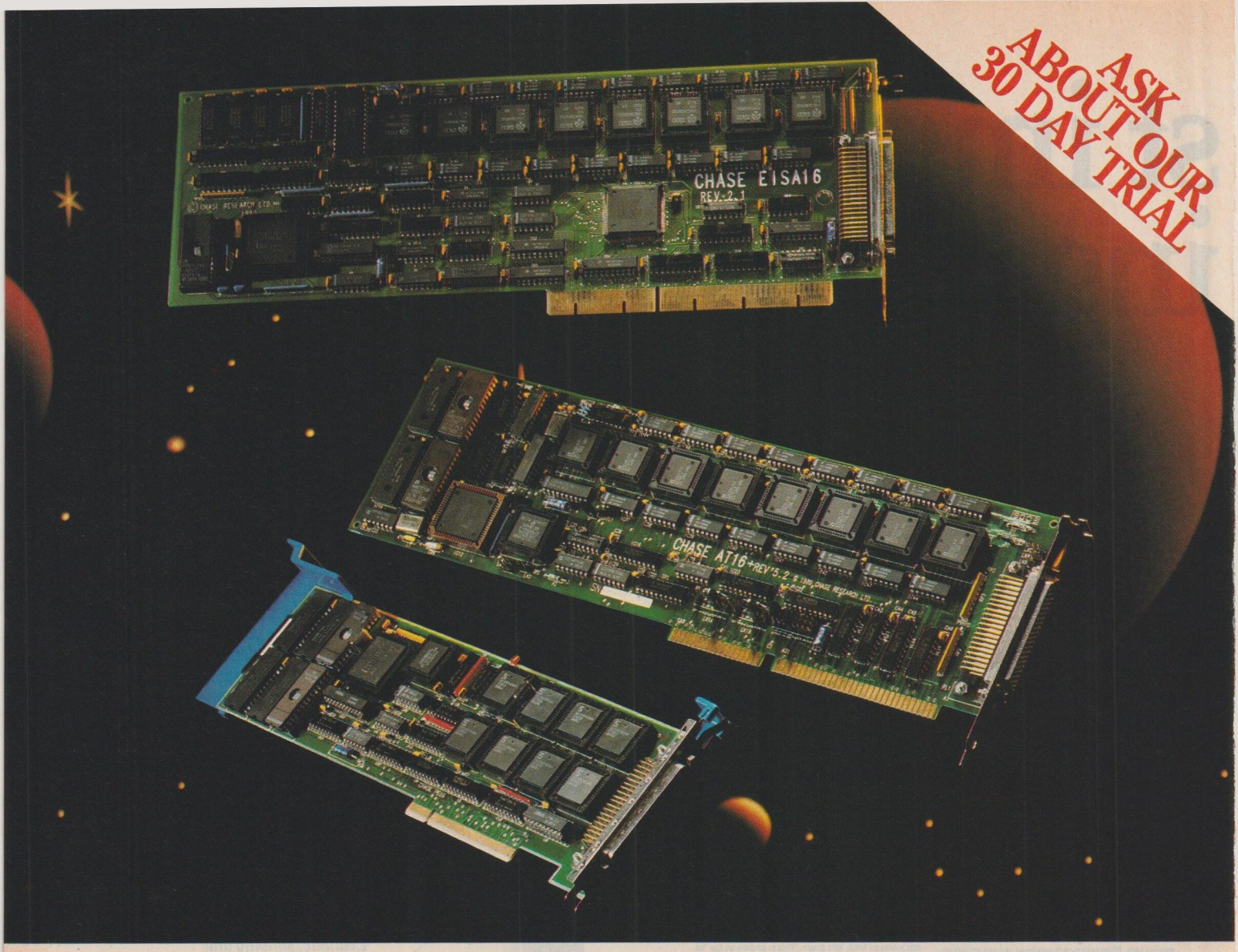

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GREAT DANE

By Gary Andrew Poole

When Bjarne Stroustrup reminisces about his native Denmark, there's a feeling in his voice that is, well, sentimental. It's an unfamiliar sound from the decidedly unsentimental Stroustrup, inventor of C++–the programming language that has helped make possible the graphics in Apple's Macintosh line and is used in products from Hewlett-Packard and Sun Microsystems. Stroustrup rarely exudes a feeling of sentimentality. He's articulate. He's intense. He's straight-forward.

"I'm not very poetic," he says, "I think in prose." Yet, when he talks about Denmark, and especially his hometown of Aarhus, he softens. Aarhus is in the middle of Denmark. An ancient harbor town of about 250,000 with a university, museums, a concert hall, and theaters. "I especially appreciate the woods stretching for miles south of the town along the bay," Stroustrup says. "In particular, there are no slums. It is easy to be homesick for a place like that." At least in his heart, Denmark will always be Stroustrup's home.

Stroustrup's roots are firmly planted in Danish soil, but his brilliance has moved him to other lands. He has lived in the United States for 12 years. The work he loves keeps him here. In 1979, he joined AT&T's Bell Laboratories, and began developing C++. The language supports data abstraction and object-oriented programming, which efficiently takes previously written code and incorporates it into a user's application.

C++ lets programmers write larger programs faster and less expensively because they're not writing linear, step-by-step instructions that take thousands of lines of code. The language was originally designed so Stroustrup and his friends would not have to program in assembler, C, or various modern high-level languages, but C++ has become a critical programming tool and now has an estimated 150,000 users.

Stroustrup's journey to Bell Labs and the invention of C++ started in Denmark. An exceptional grade school teacher named Johannes Mikkelsen got him interested in mathematics. Stroustrup was a good student, but he faced economic barriers growing up in a working-class family. His father worked as a carpet and linoleum

JOYCE RAVID

"I'm not very poetic, I think in prose."

—Bjarne Stroustrup, inventor of C++

layer, and as a porter in a hospital.

Money was scarce, but he was determined. After Stroustrup graduated from high school, he went to the university in his hometown to study microprogramming and instruction sets, but these were subjects the University of Aarhus couldn't accommodate. He applied for a grant to study at the University of London to do graduate work. He was accepted and went away. After completing his studies, he went on to Cambridge University, where he received his Ph.D and studied simulation. AT&T soon recruited him, and he moved to New Jersey at the age of 28.

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The Birth of C++

After Stroustrup arrived at Bell Labs, he became interested in complexity theory. He was troubled by the complex and enormous programs written there, and set out to make programming easier. "The problems I was facing were problems of complexity," he says. "Distributed systems and operating systems were incomprehensible. I could read the code, but it took me forever and a day."

Stroustrup eventually wrote a language intended to make writing programs easier for his colleagues at Bell Labs. "I never expected it to get as big as it has," he says, referring to the 150,000 C++ users, which reportedly doubles every year. "The idea is insane to design a general-purpose language. I don't mind difficult tasks, but I don't like the idea of certain failure," he laughs.

C++ started out as a one-man project, but soon developed into a series of brainstorming sessions with colleagues.

"The reason I continuously discussed the emerging design with my friends is that such an 'interactive' style of working is not only much more pleasant for all concerned," he says, but "it also gives the language the benefit of a much broader base of experience than a single individual can possess.

"I think these discussions helped C++ become a real language aimed at real problems under real-world constraints, rather than a sterile exercise in beauty and elegance."

The development of C++ was time-consuming. Countless hours of discussion with his colleagues took place. "It's neither the model of someone locked up in his study with a computer nor a project focus," he says referring to the development of C++. "It was more like one guy working in an environment where a lot of help was available."

"I was one of the first users [of C++]," says Jonathan E. Shopiro, a member of the technical staff at Bell Labs and AT&T's representative in the American National Standards Institute (ANSI) C++ committee. "I told him things it should have. I started complaining. He listened to my complaints."

These sessions often centered around Stroustrup's key concept in C++: class. A class is a user-defined type.

"Classes provide data hiding, guaranteed initialization of data, implicit type conversion for user-defined types, dynamic typing, user-controlled memory management, and mechanisms for overloading operators," Stroustrup wrote in his 1986 book *C++ Programming Language*. The book has been distributed in-

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ternationally and translated into several languages including Serbo-Croatian. Today, Stroustrup is in the midst of an update of this book.

The Payoff of Diligence

Stroustrup's colleagues praise his fortitude in staying with the development process. "I wouldn't have stuck it out except for my respect for him," says Andrew Koenig, a distinguished member of the technical staff at Bell Labs who works with Stroustrup on the C++ project. "C++ is like a chainsaw: it makes it possible to do a lot with a commensurate amount of responsibility."

This "responsibility" has left some C programmers ill at ease with C++. "It's so easy to fall back on the bad old ways," says Stroustrup. "It's so easy to get hypnotized by those easy little tricks." Stroustrup says good C programmers sometimes have a difficulty with C++ because its hard to avoid writing C++ in C style.

Despite this problem, Stroustrup says C was chosen as the base language for C++ because it's versatile and low-level, adequate for system programming tasks. It runs on "everything" and fits into the UNIX programming environment.

In other words, Stroustrup didn't start without a basis for C++, but in a real sense he did. He preserved the programming level of C while adding a new level of understanding.

"Creeping featurism remains a danger," he says

Developing a new programming language is like trying to start a car company in 1991. The chances of success are slim. Stroustrup says he's amazed at how successful it has been. Yet, there are downsides: C++ has generated controversy because vendors want a piece of the C++ pie. They want their own "pet ideas" in the system, says Al Aho, former director of the Computing Science Research Center at Bell Labs.

As a result, Stroustrup has had to juggle commercialism, theory, and reality. He says, "Creeping featurism remains a danger. But I think that up till now I have managed to avoid excesses and create a smooth blend of features." Still he admits, "no language is perfect, but I suspect that the greatest danger for C++ just now is excessive zeal for perfection."

"Bjarne has exercised care and judgement in deciding what should be in the program," says Aho. "He anticipates problems. He talks with users and the technical community. He has a remarkable breadth of understanding of these two groups."

"Bjarne *always* stays focused," reiterates Bell Labs' Shopiro.

Long Hours and Commitment

Stroustrup focuses much of his time on work. He has an office at home where colleagues say he's often logged in to Bell Labs' computer system into the wee-hours of the morning.

"He's always working," says Barbara Moo, technical supervisor at the Labs, who is responsible for managing the development of C++. "He's delightful to work with. He's always willing to work with folks."

When Stroustrup finds time for leisure, he enjoys reading history. He likes to spend time with his wife, whom he met in London, and his two children, a 14-year-old daughter and an 8-year-old son. He's also been known to recreate the atmosphere of his beloved Denmark in his New Jersey home.

"I went over to his house for dinner once and he and his wife prepared a traditional Danish cold table with cold cuts and *a lot* of beer," says Koenig. "We drank a lot of beer. We had to take a walk in the woods for a couple of hours to sober up."

For the future, Stroustrup says he's "doing a fair bit of thinking about design (of programs, not of programming languages), libraries, and development environments."

In many ways he would rather live in Denmark, but, he says, the work is here. The work, the interest, and the notoriety that C++ has generated might keep Stroustrup in the United States a long time. ■

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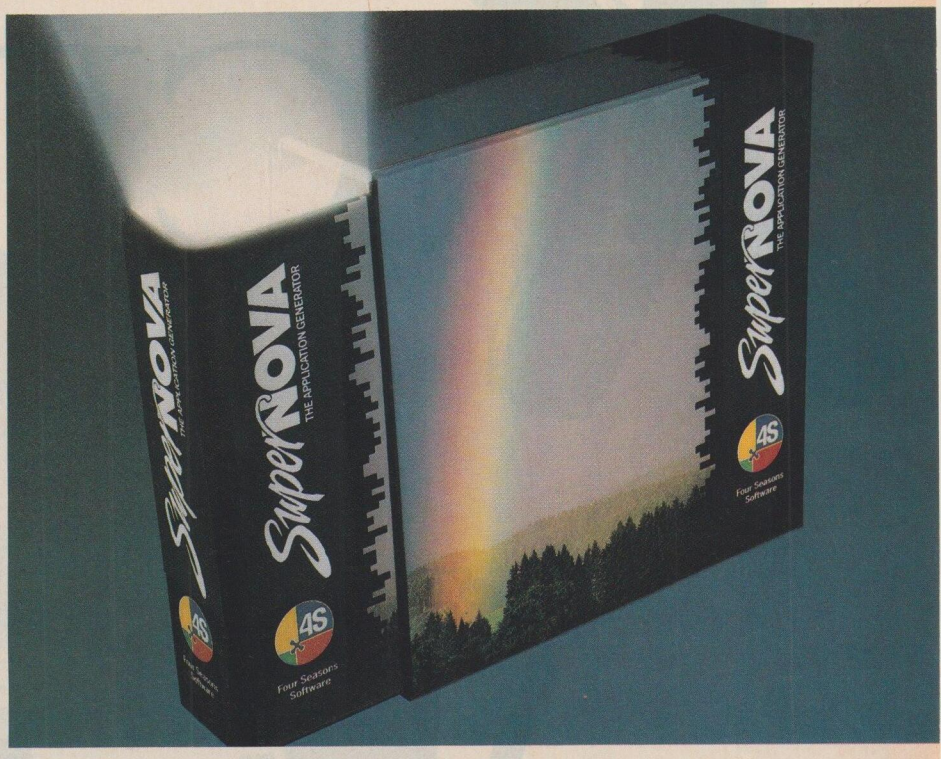

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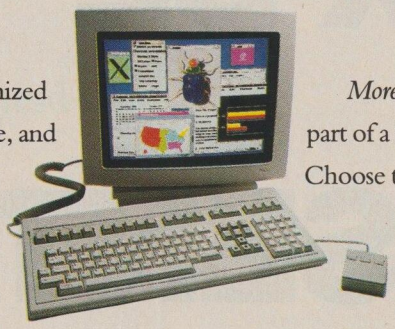

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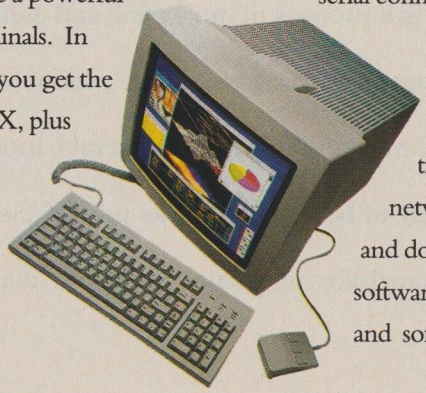

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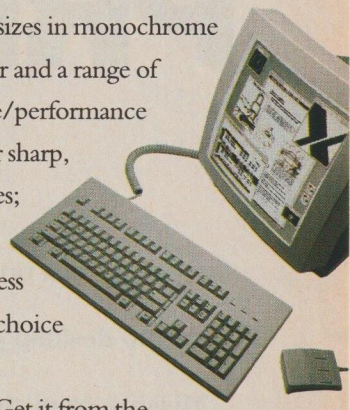

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WHY CAN'T UNIX BE PRESENTABLE ?

The big software vendors are missing when it comes to the best presentation graphics on UNIX

The UNIX office of today is competitive: top-notch word processing programs, best-selling DOS spreadsheets, excellent database programs, and powerful desktop publishing packages are found on multiuser systems or workstations.

Missing from the party, however, are the best presentation graphics packages from the PC and Macintosh worlds. Because so much of any business is a process of marketing and selling, presentation graphics have emerged as an excellent tool in the persuasion process. These products tend to be most frequently used by "presenters"–those who use 35mm slides or other formal interactive desktop presentations more than once or twice a year. Unlikely to be spelled out as part of the job description, the tasks of a presenter can often end up the responsibility of a sales manager, marketing director, product manager, or group supervisor.

In the DOS and Mac markets, none of the major presentation graphics vendors, including Microsoft, Software Publishing (SPC) or Lotus, has ported their best selling products to UNIX. What within UNIX has kept this software at bay?

continued

BY MIKE BURGARD

MARK JOHANN

Macintosh
2.0
ALDUS
Aldus Persuasion
Lotus Freelance Plus
#1
Lotus Freelance Plus
WEEK
INFO WORLD
PC WORLD
For IBM compatibles, DOS
NEW VERSION
Harvard Graphics 2.3
Powerful presentations for the business user

LOTS OF GOOD REASONS TO STAY CLEAR

Coming across as the single greatest hindrance to UNIX development was the lack of a substantial user audience. David Roberts, director of business products for Aldus, puts it this way, "There just do not seem to be enough users on any one platform or interface to allow Aldus to sell its product for say $500 and break even."

Vendors maintain that users of presentation graphics are DOS-based with their applications and are not typically UNIX workstation users. Ashton-Tate and Computer Associates concur on the need to direct resources to the largest market. In one fashion or another, most vendors see the typical UNIX workstation user as a techie with no need for sales or marketing tools.

The very nature of presentation graphics on DOS and Macintosh adds more weight to the vendors' arguments. The reason to switch to a UNIX system of any type depends on the user's need for such issues as open systems, multiuser environment, multitasking environment, and strong networking.

Interest in UNIX presentation graphics remains mostly with bit-mapped workstations rather than the far more prevalent character-based multiuser systems. DOS and Macintosh vendors considering UNIX will only do so in a graphical environment, believing that the typical multiuser system is an inappropriate platform. In particular, vendors with programs that were already graphically based were simply unwilling to backtrack into the character-based world.

As of now, none of the major packages really benefits from any of the advantages of UNIX. As Rick Kreysar, vice president of marketing for Cricket Presents, says, "Other productivity categories–spreadsheets, databases, etc.–benefited substantially from the increased horsepower of UNIX and therefore justified a quick port. Presentation graphics just don't present themselves with inherent advantages on UNIX unless substantial changes are made."

There are two separate concerns here. Vendors say current users of presentation graphics have no reason to move up to a UNIX system because it provides little advantage. Current workstation users are saying that until more capability is present in standard presentation graphics, there is little reason to demand them for UNIX.

This is not to say there are no UNIX presentation graphics programs out there. A passel of contenders include Grafsman from Soft-Tek International, Autograph from Ficor, and Graficus from Grafit (see sidebar). In general, these products contain an adequate suite of features, but lack the combination of functionality and ease of use when compared with their PC- or Mac-based counterparts.

VENDORS GO WITH THE MARKET

As shown in the accompanying chart, the top makers of presentation graphics packages are more interested in IBM's OS/2 than UNIX. While it is no secret that OS/2 is not taking off like wildfire, significant software resources have been dedicated to this non-market. Yet almost all of these companies claim to be "market-driven" in product development.

Lotus released an OS/2 version of Freelance in the fourth quarter of 1990. It's not the only leading company moving to another operating system first before considering UNIX. Aldus has recently released its Windows version of Persuasion and is developing an OS/2 version. SPC's Sharon Grimshaw, product manager for strategic markets, says SPC had put nearly all of its eggs in the OS/2 basket and is now scrambling to produce a Windows product, leaving UNIX development as a secondary priority.

Microsoft is obviously in the most controversial position with regard to UNIX vs. OS/2 development. In partnership with IBM, Microsoft can hardly ignore the development side of the equation. Microsoft is publicly committed to providing OS/2 products, as shown by its release of Excel and Word. A version of Powerpoint surely cannot be far behind.

WHAT IF THE SAME DOS PACKAGE COSTS MORE ON UNIX?

Beyond user base and operating system supremacy, nearly all vendors felt UNIX's distribution channel and pricing structure were legitimate concerns. DOS and Mac vendors are conditioned to deal in large volumes of low-priced, shrink-wrapped products. They are concerned about the lack of a dealer-friendly channel for UNIX products, and about the higher price of the same software for UNIX.

Aldus' Roberts explains, "We have always felt the users of workstations needed the same productivity software available to the PC user, but we don't want to be in the business of charging exorbitant amounts for that software. We do see more and more corporate clients opting for a UNIX platform," he admits.

continued

Who's Who in Presentation Graphics

When Lotus 1-2-3 first introduced business graphics in 1983, easy-to-use charts and graphs were finally available to the masses. Somewhere in the mid-1980s, a separate category of software came to be known as presentation graphics with the expressed purpose of generating formal presentations.

In the DOS market, Harvard Graphics from SPC holds more than half of the market share (see chart). Other significant players include Freelance Plus from Lotus Development and Applause from Ashton-Tate.

Harvard Graphics had an early jump on its competitors with its numerous chart types. Its overlay menu system was one of the easiest to use in the mid-1980s because it took full advantage of function keys. Each of these products also has outstanding preview functions. The ability to add symbols and draw your own charts increases the flexibility of these tools.

Windows 3.0 supports Microsoft Powerpoint and Computer Associates Cricket Presents as well as other recent additions. In the Macintosh market, Powerpoint, Symantec's More, and Aldus' Persuasion appear to have a strong lock on the market. In the graphics-based world, most of these products take a global approach to presentations by providing templates and masters that give consistent backgrounds and colors to the entire presentation. For example, you can change the background on 50 slides merely by changing the template in Persuasion. The ability to easily create a new presentation after a considerable lapse of time is also an important trait in all of these products. —*M.B.*

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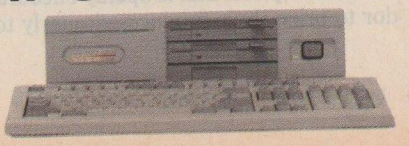

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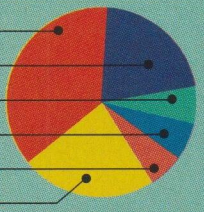
CIRCLE NO. 247 ON INQUIRY CARD

Who Holds the Lead ?

When released, 1990 market share data will show significant inroads by Windows products into the DOS marketplace, as well as improved standing for the highly popular Persuasion on the Macintosh.

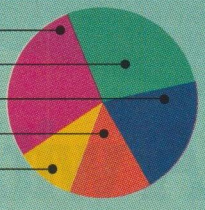
1989 PC/MS-DOS Market Share

- Harvard Graphics (Software Publishing): **36.9%**
- Freelance (Lotus Development): **21.1%**
- Graph-in-the-Box (New England Software): **6.3%**
- GrafTalk (Software Solutions): **6.3%**
- Graphwriter (Lotus Development): **6.2%**
- Others: **23.2%**



1989 Macintosh Market Share

- Powerpoint (Microsoft): **28.4%**
- Cricket Graph and Presents (Computer Associates): **27.6%**
- More II (Symantec): **19.9%**
- Persuasion (Aldus): **14.2%**
- Others: **9.9%**



SOURCE: International Data Corp.

Where are the Leading Vendors Porting?

As the table indicates, Windows 3.0 is getting the most attention, and among the top vendors OS/2 is attracting more interest than UNIX at present.

Vendor/Product	*DOS*	*Windows*	*OS/2*	*Mac*	*UNIX*
Lotus Development/Freelance Plus	✓	✓	✓	⊘	?
Software Publishing/Harvard Graphics	✓	✓	?	?	?
Ashton-Tate/Applause II	✓	✓	?	?	?
Microsoft/Powerpoint	⊘	✓	✓	✓	⊘
Aldus/Persuasion	⊘	✓	✓	✓	?
Computer Associates/Cricket Presents	⊘	✓	?	⊘	?

✓ Shipping ✓ Developing or Announced ? Considering ⊘ No Plans

Similar encouragement is seen down the road by Computer Associates' Kreysar. "We have been waiting for the market to open up with an improved distribution channel and lower prices. The original perception was that UNIX was for engineers and that's why we were out there with graphics products for engineering functions on UNIX. As the price drives down, we see more room for an increased user base."

Sun and The Santa Cruz Operation (SCO) are both publicly committed to creating a strong channel for UNIX products at a reasonable price. Sun is openly encouraging the software vendor to price their products similarly to DOS products. "Sun sees that prices are going to drop on UNIX packages rather than rise in the next few years, perhaps putting a squeeze on the traditional UNIX vendor with its labyrinth of support," according to Sun's A.C. Ross, director, desktop applications. Roberta Gray, marketing manager of developer relations for SCO sees a strong channel as a key for UNIX success and believes SCO has a strong base from which to build that channel.

VENDORS CONTINUE JUST EVALUATING

SPC, the producer of Harvard Graphics, shows more interest in UNIX than perhaps any other vendor. Product Manager Grimshaw says UNIX is a key platform for SPC due to its presence in the government market. "We are hearing from more customers that they want a UNIX version of Harvard and hearing less from customers asking for a OS/2 version." SPC is "closely evaluating the UNIX platform where a year ago we were not."

Ashton-Tate is interested in investigating OS/2, Macs and UNIX versions of Applause II. As Richard Dym, director of graphics products, points out, "We are acting like we have just re-entered the presentation graphics market with Applause II and are considering ourselves newcomers. We are just now going through the analysis as to what platforms we will pursue."

Computer Associates is considering both the OS/2 and UNIX markets. Because Cricket Presents is graphics-based, it will never go from the graphical user interface (GUI) arena back to a character-based UNIX port. The real key according to Kreysar is not just porting a Windows product to a UNIX GUI such as Motif or Open Look, but rather integrating new functionality that takes advantage of the inherent features of UNIX such as networking.

Both Lotus and Aldus have made no commitment to port their business graphics products to any variant of UNIX, although Lotus' UNIX version of 1-2-3 is a reasonable indicator of future plans. Says Tim Davenport, Lotus' manager of graphic products, "We have ported our flagship product to UNIX first. We intend to evaluate its success and then follow-on with other products." The reality is that presentation graphics is really no company's flagship program. In any case, if there were a large number of presentation graphics users on UNIX, no one would be adopting a philosophy of "we want to introduce our flagship product and ignore all those users from whom we could make some money." Examples abound with the sharing of corporate logos, clip art galleries, and so on.

At the far end of the stick is Microsoft, with no plans to give UNIX any serious consideration in the near future.

continued

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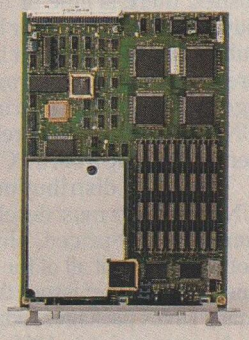

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CIRCLE NO. 208 ON INQUIRY CARD

IS UNIX MAKING INROADS?

Because most of these vendors claim to be market-driven, it appears that if they choose UNIX at all, they'll go with the largest installed base. Currently it is SCO's 386 UNIX and Sun's SunOS.

Sun has dedicated specific individuals to convince vendors to port to Open Look, its graphical user interface. A.C. Ross is Sun's great evangelist, sent on the road to persuade DOS and Mac vendors to port products over to Open Look. He has had great success with products such as Lotus 1-2-3 and dBase IV. However, he admits the presentation graphics nut is much more difficult to crack.

"There is a big demand among Sun users for a presentation graphics package. Lots of users are forcing Interleaf or Frame to meet their needs," says Ross. SCO does not see such a demand building on their systems, character-based or workstation-based, with respect to presentation graphics. Perhaps the differences in perception between Sun and the major software vendors can be attributed to the fact Sun is looking at it from how many Sun users need presentation graphics, while the big software vendors look from the view of how many users are there on Sun.

Three things must happen before any of these DOS or Macintosh vendors get serious about putting together a UNIX version of their presentation graphics product. Primarily, they must perceive a significant user base on UNIX workstations.

Second, with so many UNIX shops having access to DOS PCs or Macintoshes, there is little or no incentive to buy the same package for UNIX. Without substantial improvement in the ability of presentation graphics programs to leverage networks, file sharing, and other UNIX advantages, there remains scant incentive to move from a PC or Macintosh.

Third, the distribution channel for UNIX products must develop to a point of handling low-priced, shrink-wrapped software without all of the customization and fancy support issues that so entangle many UNIX packages today.

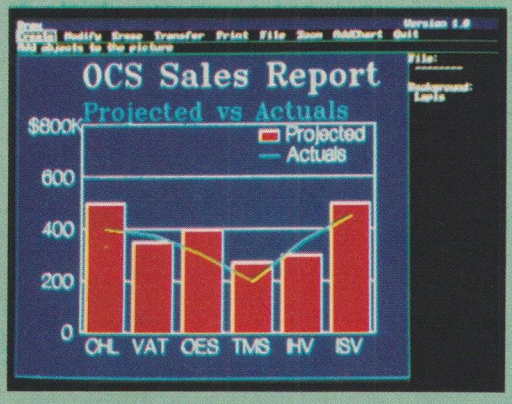
At some point in 1992, one or two of the traditional DOS/Mac vendors will probably port a network-aware version of their product to UNIX. These products will likely change the way we see presentation graphics by incorporating shared files, images and possibly even video. Only then will a complete suite of applications be available on the UNIX workstation from the leading DOS and Macintosh vendors. ■

Editor-at-Large Michael Burgard is a regular reviewer for UNIXWORLD and a data systems information manager for a commercial printing company in Montana.

Yes, You Can Buy UNIX Presentation Graphics

UNIX is not a mother barren of child when it comes to presentation graphics. Many products are available on a variety of platforms. In general, these products are capable, but lack the ease of use and robustness found on PC and Mac platforms. However, by the time you read this, at least two traditional UNIX vendors–Ficor and Graphicus–plan new products incorporating many of the features and capabilities found on the most popular DOS presentation graphics.

Currently, most of these UNIX products support a variety of chart types including various bar, line, and pie charts. Tools providing the ability to draw boxes and polygons, or to shape and rotate symbols, are more limited than in their DOS companions, but still present. Importing data from third-party applications like a database is often supported, as are an array of output devices.



Most often missing are ease-of-use and ease-of-learning devices like strong mouse support or on-screen drawing. Simply put, the leading products have a consistent interface that makes it easy to pick up the product after a substantial absence. UNIX products tend to adopt varied interfaces that are not even consistent within the program.

A key element seldom found in UNIX packages is the ability to view all the graphs and charts on the screen simultaneously and to rearrange the presentation on-screen. No UNIX package lets you create notes attached to each slide that can then be printed out as a set of speaker notes.

You can create a presentation in UNIX, but the extra time and energy required is not rewarded with a more robust final product. The packages listed below are a sampling of those available in UNIX. They seem more suited to sticking a few charts into a business report than presenting it in a formal setting.

■ **Autograph**, Ficor (Cincinnati, Ohio) SunOS, System V. Large number of supported charts, supports various output devices. New version for Sun to be released in early 1991 with many popular DOS features.

■ **Grafit**, Graphicus (Kirkland, Wash.) HP-UX, Sun, SCO System V. Large number of charts supported, command line-driven, no interactive drawing. Brand new Open Look product for Sun due in early 1991 with a full palette of tools and presentation features.

■ **Grafsman**, Soft-Tek International (Wichita, Kans.) System V UNIX on various platforms. Integrates with UNIX databases, large number of observations, variety of charts and templates. No interactive drawing or true slide show tools.

■ **Image Builder** (shown above), The Santa Cruz Operation (Santa Cruz, Calif.) SCO UNIX and XENIX. Standard drawing tools, various chart types, mouse interface, support for color on console monitor. No presentation tools.

■ **Q-Chart**, Quadratron Systems (Westlake Village, Calif.) Numerous chart types, multiple data sets per chart, extensive text positioning, legends, titles, and annotations. Good printer support. Integrates with other software.

■ **SAS Graph**, SAS Institute, Inc. (Cary, N.C.) Runs under HP-UX, Ultrix, AIX and SunOS. Support for variety of charts and output devices, slide show link to a service bureau. No outlining or notes facility. —*M.B.*

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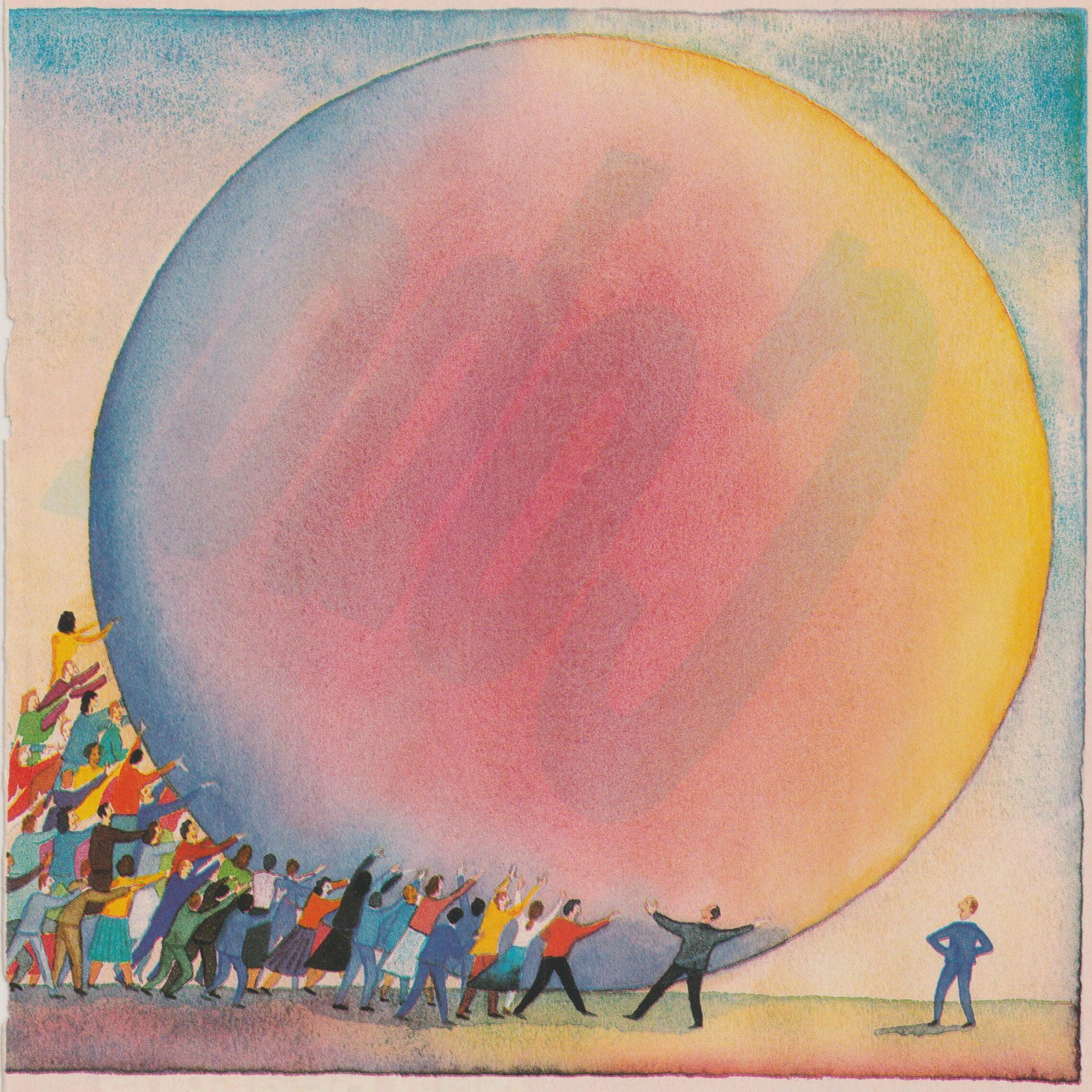

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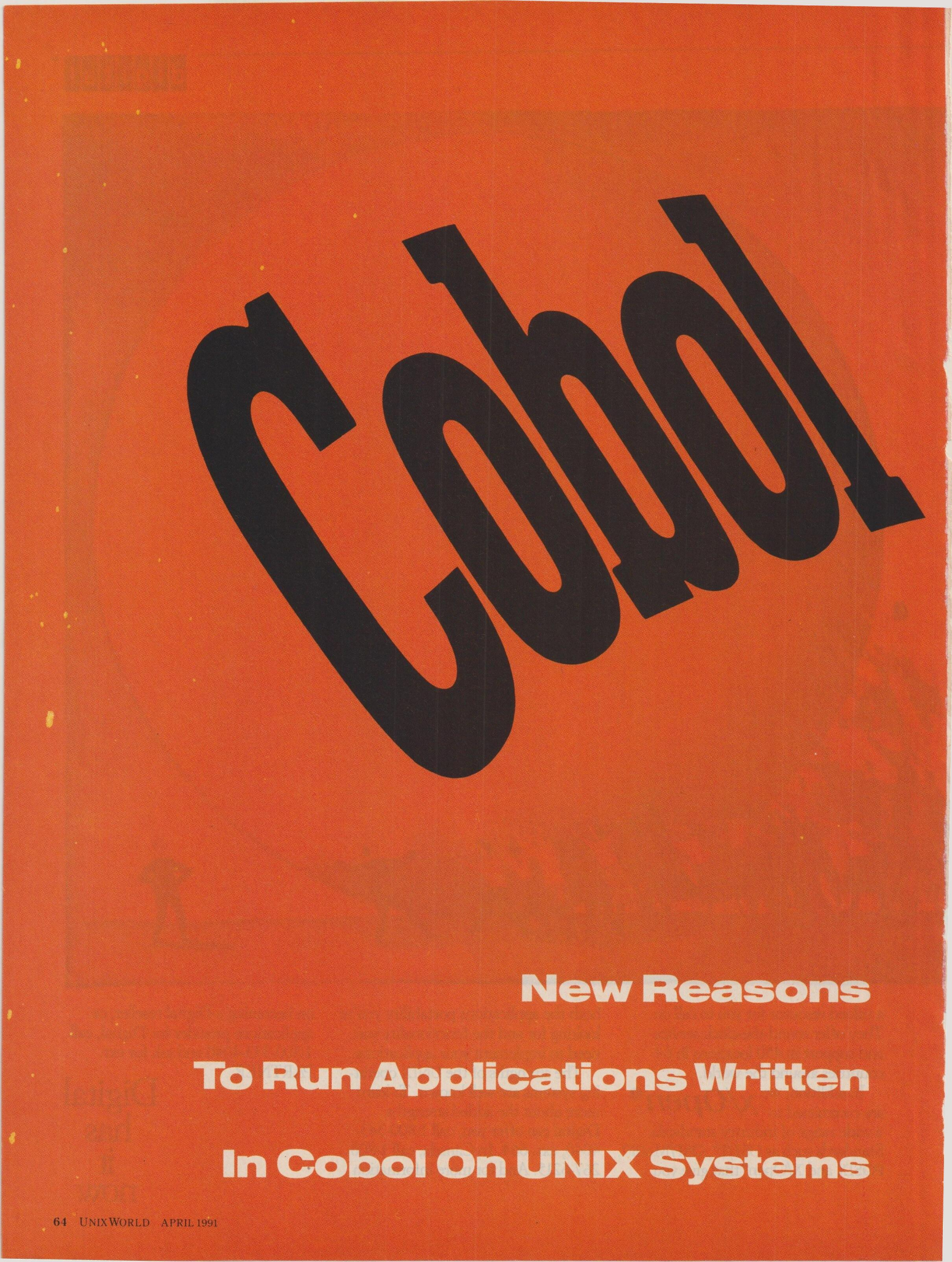
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The Mainframe Gap

For some UNIX diehards, Cobol is a dirty word. But for management information systems (MIS) people who want the advantages of open systems, Cobol is a matter of life or death.

Many information systems managers could live without the traditional mainframe trappings–such as IBM's name, air-conditioned computer rooms, PROFS for mail, etc.–but they can't live without Cobol. That is because they have hundreds, or even thousands, of programmer-years invested in their custom-built Cobol applications. It would be prohibitively expensive to translate those custom applications to another language. Yet, throwing them away is out of the question–these are the applications the companies depend on every minute of every day.

Fortunately, making the connection between Cobol and UNIX isn't as difficult as it sounds. UNIX has Cobol compilers, but Cobol-savvy vendors have also created specific solutions to the problems of running Cobol programs, designed for mainframe databases, on UNIX systems. However, in spite of the opportunities UNIX offers MIS Cobol users, there is still a long way to go before the process of adding UNIX to Cobol is seamless–or even simple.

Cobol is the language for mainframe-based commercial applications. The numbers are impressive: A recent International Data Corp. study reports

BY FRANK HAYES

there are 80 billion lines of Cobol code currently in use–that's 56 percent of all applications. There are three million Cobol programmers worldwide, and four out of five Fortune 500 companies use Cobol. Just about anywhere you find mainframes, you'll find Cobol–even AT&T, the birthplace of UNIX, has 7,000 Cobol programmers.

Big numbers don't tell the whole story, however. A typical Cobol application is older, larger, and more "mission critical" than applications in newer languages such as C. Often enough, a Cobol application has grown to tens of thousands of lines of code after decades' worth of changes, upgrades, and bug fixes. And, a business depends on that application continuing to work continuously and reliably.

Ironically, the biggest barriers between the Cobol world and UNIX aren't technical–they're cultural. UNIX partisans see big iron with its monolithic structure and proprietary operating systems as the opposite of distributed, open systems. As for mainframers, "If you say UNIX, they say, 'What? Is that still around?'" laughs John Phillips, director of marketing communications for UNIX Cobol vendor VISystems and a mainframe veteran himself.

Actually, mainframes and UNIX are based on radically different philosophies. Mainframes are oriented toward large, commercial, repeatedly modified, mission-critical applications. UNIX, by contrast, was created for small, technical, modular programs that don't suffer much from an occasional crash.

The differences extend to languages: typically, mainframe Cobol programmer expertise is focused on solving business problems, while UNIX C expertise is focused on solving technical problems. Cobol is maligned as a "dumbed-down" language by UNIX programmers whose C is just as easily mocked as a "high-level assembly language." Cobol's forte is highly reliable and easily maintained code that will last for generations, while C is designed for building modular tools that can be quickly snapped together to solve the problem of the moment.

Selected UNIX Cobol Vendors and Products

AcuCobol, Inc. 7950 Silverton Ave., Ste. 201, San Diego, CA 92126; 619-689-7220
AcuCobol-85

Micro Focus, Ltd. 2465 East Bayshore Rd., #400, Palo Alto, CA 94303; 415-856-4161
Micro Focus Cobol/2 for UNIX

Ryan McFarland Corporation 8911 Capital of Texas Hwy. N., Austin, TX 78759; 512-343-1010
RM/Cobol

Sun Microsystems, Inc. 2550 Garcia Ave., Mountain View, CA 94043; 415-960-1300
Sun Cobol

VISystems, Inc. 11910 Greenville Ave., #300, Dallas, TX 75243; 214-907-8080
VIS/Cobol and related tools

This list contains contact information only for those vendors mentioned in this article and is not intended to represent all the vendors in this market.

The Successful Mix

Fortunately, if you can master the philosophical differences between mainframes and UNIX, the technical gap is relatively easy to bridge.

Cobol compilers are sold for UNIX by several independent software vendors. The biggest name in UNIX Cobol is Micro Focus whose Cobol/2 is licensed to many hardware vendors (including Sun) to sell under their own brand name. Other vendors include Ryan McFarland, AcuCobol, and VISystems. Each has a slightly different approach, but all promise that they can compile standard Cobol code–not just ANSI-standard Cobol, but also the dialects used on IBM VSE and MVS mainframes.

Each compiler also promises optimized code. (Micro Focus and Ryan McFarland compile directly to runnable code, while AcuCobol and VISystems translate the Cobol to C instead, and then use an optimizing C compiler.) They even offer UNIX-style program development tools like editors and source-code debuggers.

Moving Cobol source code and recompiling it isn't the only issue you'll face if you port most mainframe applications. Those applications are usually designed for a single large mainframe with an integral database. In contrast, UNIX's strength is communication among multiple systems, so getting the most out of UNIX may mean splitting some of the work onto several smaller systems. You may need to add a database management system, because UNIX doesn't come with one. And though the basic Cobol code may recompile without problems, special extensions (such as display extensions for 3270 terminals) will require extra attention.

In short, you'll need to carefully choose exactly how to use UNIX with your current applications. Fortunately, there's no reason you have to make the jump completely. In fact, one of the simplest ways of adding UNIX to your Cobol mix is to take your programmers off the mainframe and put them on UNIX-based workstations. Another relatively easy approach involves spinning off departmental applications that don't actually require access to mainframe databases–word processing, for example–to UNIX machines.

Now Add Workstations and Stir

Moving programmers off the mainframe to do their program development on UNIX workstations is exactly the strategy Sun Microsystems is promoting with its recently introduced Sun Cobol. Sun Cobol is actually a licensed version of Micro Focus Cobol/2, with additional Sun networking enhancements; of course, other UNIX Cobol vendors also have versions for Sun workstations.

Kevin Moultrup, Sun's senior product manager for Cobol, says Sun sees a lot of demand from programmers in mainframe shops for UNIX price and performance. "Mainframes are never going to go away," Moultrup says. By getting programmers off the mainframe and onto workstations, they won't be competing for CPU power with jobs that must have real-time access to the

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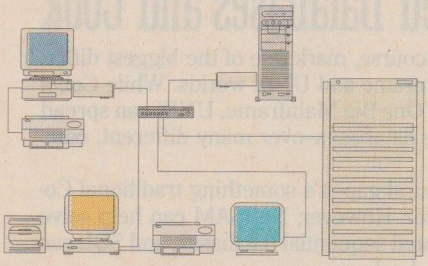

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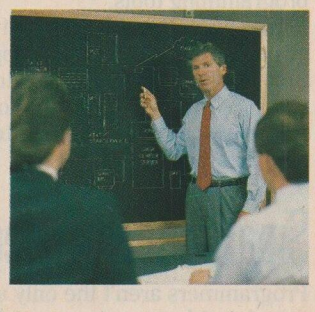

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mainframe's database, for example. And once the Cobol code is complete and has been tested on a small scale, it can be moved back to the big iron for final testing and implementation.

UNIX workstations for programmers offer several advantages for mainframe shops. They ease the demand for mainframe processor power–the mainframe can run at full tilt no matter how many programmers are working on code. They let you add just the amount of additional power you need, one programmer's worth at a time–a fairly painless way of getting UNIX's price and performance. And they lend Cobol programmers UNIX's advantages as a program development environment, with a wide choice of editors, debuggers, and other programming tools.

However, because it's just the programmer, not the running application, that moves to UNIX, you dodge the thorny problems of fitting your mainframe-based applications into the different design of UNIX.

Looking For Advice?

UNIX and Cobol can mix–but not all UNIX consultants and value-added resellers (VARs) know that. Many consultants and VARs may not understand why you need to port existing Cobol applications to UNIX–and why you're not willing to simply trade your mainframe in for a UNIX system.

If you feel overwhelmed, keep in mind the major differences in philosophy between mainframe and UNIX systems. Be sure your consultant or VAR is familiar with modern Cobol dialects and features. Many otherwise-expert UNIX consultants are only familiar with the Cobol-68 they suffered through in college classes years ago.

Most critically, make sure you take full advantage of UNIX's standardized applications for office and programmer productivity. Judiciously adding UNIX to your mainframe mix can give you UNIX price and performance for hardware and software, improved productivity and reduced maintenance workload for your information systems staff–and also let your mainframe do what it does best. *—F.H.*

Smallframe Strategy

Programmers aren't the only users you may be able to wean away from the mainframe. Some departmental applications, like word processing, don't require access to a database at all. And others may use only a departmental database–not the large, transaction-processing-oriented database that's the core of your mission-critical applications. By moving these departmental applications from the mainframe to UNIX, you can take stress off your big iron and allow better response time for the people who need mainframe access.

If a departmental application is a generic productivity tool like a word processor or spreadsheet, you may want to choose a similar UNIX-based program from an independent software vendor. But if you've developed specialized applications in Cobol–especially if they use the mainframe's database capabilities–porting the Cobol program will require resolving some of the differences between mainframes and UNIX. For example, on a mainframe the Cobol application would probably communicate with a transaction manager, which obtains data from the database that is integrated into the operating system. But, there is no integral database under UNIX. One option is a full-blown relational database management system (RDBMS) in which the recompiled Cobol code would produce SQL queries to get data from it.

For simple applications, that may be overkill. One alternative, according to Phillips of VISystems, is a "smallframe" strategy. Phillips says that instead of just building a Cobol compiler, VISystems' mainframe expatriates created UNIX versions of IBM's VSAM and CICS. Bringing a little bit of the IBM world into UNIX, Phillips says, lets you port Cobol applications "without having to touch the code."

The company also has products that provide access to hierarchical databases such as DL1 and IMS. Phillips says eventually the company will do the same for SQL/DS and DB2, IBM's relational databases. "It's the best of both worlds," he says–"the price and performance of UNIX and the size and security of mainframes."

Add Distributed Databases and Cook

Distributed systems, of course, mark one of the biggest differences between the mainframe and UNIX worlds. While Cobol comes from the world of One Big Mainframe, UNIX can spread its resources–including databases–over many different, communicating machines.

This is not just a cultural gap–it's something traditional Cobol just isn't designed for. However, NetISAM can help solve the problem for distributed sequential databases, and SQL can do the job for relational databases.

NetISAM is a specification developed by The X/Open Consortium for an Indexed Sequential Access Method (ISAM) that works across networks. In simple terms, NetISAM lets a program ask for data by a particular key value or record number, regardless of where the data actually resides on the network.

There are drawbacks, though. At least for now, NetISAM is strictly for use with sequential databases on UNIX machines. That means NetISAM-based applications can't use data on both UNIX systems and, say, an IBM VSAM database.

continued

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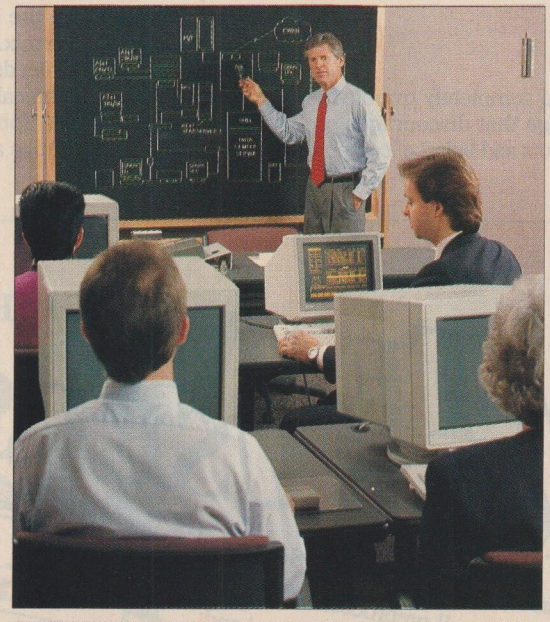

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- Network Design Tools

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- Plexus
- Epoch

Electronic Mail
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DBMS
- Informix
- Ashton Tate dBASE IV

Graphical User Interfaces
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- VISIX Looking Glass
- SunView Deskset
- X Windows

Office Automation
- Lotus 1-2-3 for Sun
- Lotus 1-2-3 for UNIX System V
- WordPerfect
- Uniplex

Electronic Publishing
- FrameMaker

UNIX
- Sun OS for Users
- UNIX Fundamentals
- UNIX Systems for Programmers

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Distributing data with relational databases is somewhat easier. A Cobol application that has been compiled to work with an RDBMS sends its SQL queries to the database manager, which collects the data regardless of where it physically resides on the network. A UNIX RDBMS can even access data on a proprietary mainframe through a gateway. It does any necessary data translation (for example, changing text between IBM EBCDIC and UNIX-style ASCII), as well as tweaking the SQL queries to be mainframe-compatible.

A gateway isn't a perfect solution, but for the moment it's necessary. Though IBM mainframe relational databases use a dialect of SQL, it's not compatible with ANSI-standard SQL–and even the ANSI-based UNIX RDBMSs use incompatible SQL dialects. An industry consortium called the SQL Access Group is currently working to develop a common SQL dialect. It won't be used in products for at least a year or two, but it may eventually allow direct SQL queries between mainframe and UNIX relational databases.

Cool and Enjoy

Of course, there is no such thing as a completely trouble-free program port. Because it's a language that discourages programmers from getting down to the "nuts and bolts" of computer hardware (as C programmers seem inclined to do), Cobol offers a very high degree of portability for code. As a result, the central code in a Cobol application will often move from mainframe to UNIX fairly smoothly.

Specialized extensions are likely to cause problems. Most mainframe Cobols have special display extensions for improving terminal displays, and those must be carefully translated to get the display correct on UNIX screens. UNIX Cobols, in turn, have their own display extensions. Several vendors have recently introduced expanded versions of Cobol's DISPLAY and ACCEPT verbs, allowing programmers to add graphical-user-interface-like features such as pop-up windows and pulldown menus.

In addition, some UNIX Cobols allow programs written in a fourth-generation development language (4GL) to run either side-by-side with Cobol programs, or make calls to the Cobol code. The 4GLs are designed to speed application development, while using Cobol as the core of such a mixed application offers terse, fast, reliable code.

If you can isolate the specialized extensions in your Cobol programs–and face the differences in database style–Cobol and UNIX really can mix. Exactly what mix you'll use depends on your application needs. As long as you don't underestimate the cultural and technical differences between the two worlds, you should find that Cobol is a bridge, not a barrier, between proprietary mainframes and open systems. ■

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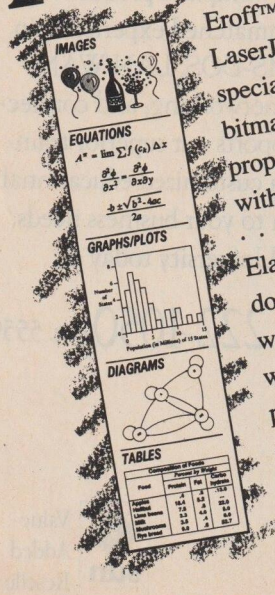

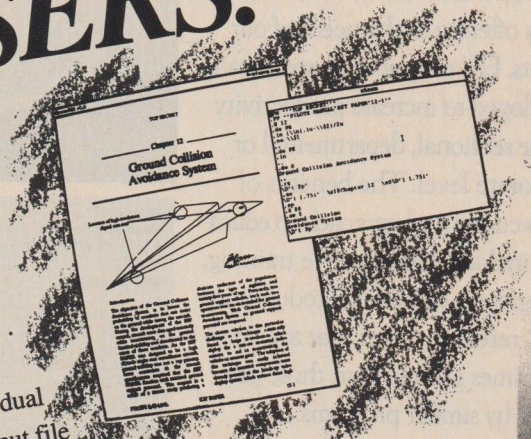

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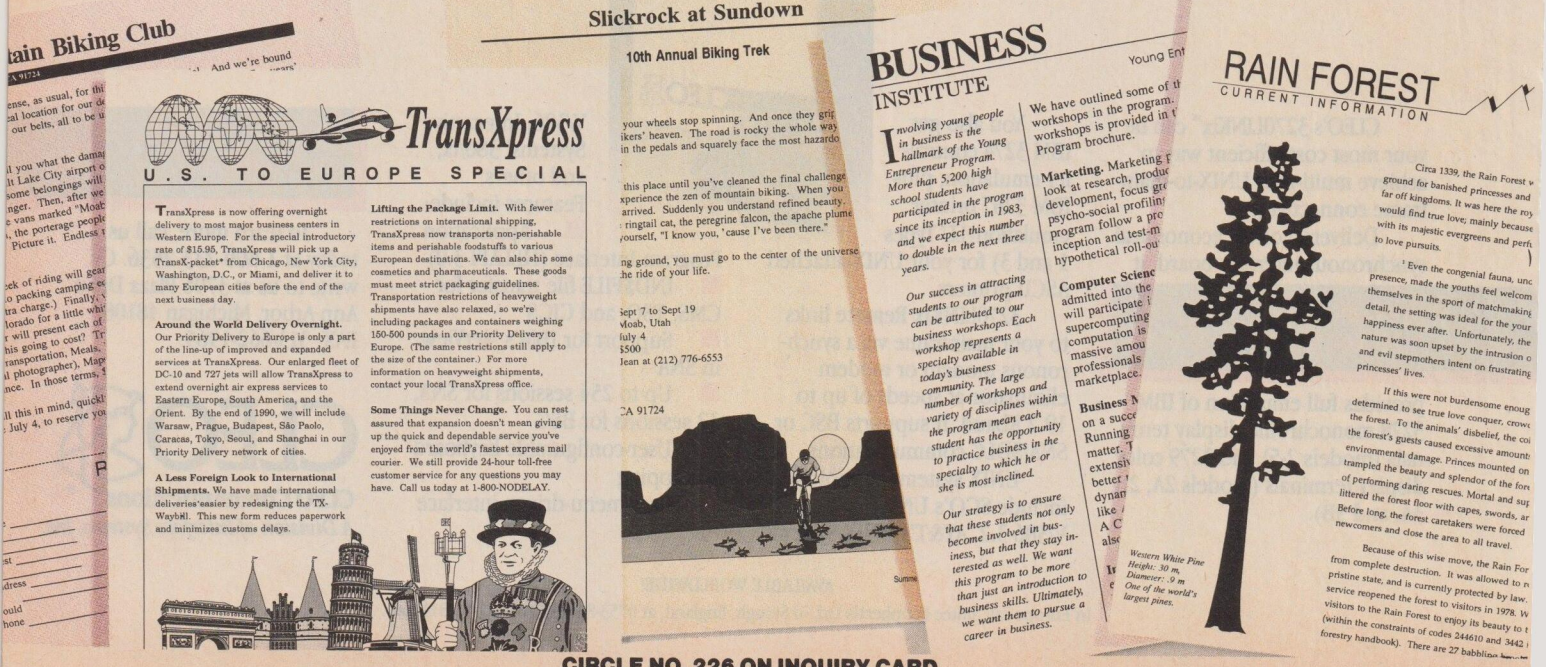

CIRCLE NO. 226 ON INQUIRY CARD

NEW APPLICATIONS FOR X IN THE OFFICE

By Howard Baldwin

Take your pick: Standalone or integrated, workgroup or desktop

There is good news for system administrators and users in the office environment. If you've seen X applications in other areas, there are now several choices for business applications. Additionally, Dataquest expects the percentage of these applications to grow from 12 percent of all X software in 1990 to 42 percent of all X software in 1994.

This projection is not surprising. After all, MIT's X Consortium designed the X protocol to be both operating system-independent and network-independent, so it's logical that X software would blossom in places where multiple networks and multiple operating systems have already grown. It is also logical for X to have a big presence because desktop applications, by definition, frequently require the combination of data from different sources.

A marketing report, for example, has text that requires word processing and numbers that require using a spreadsheet. The numbers will probably have been updated from a database, and you might want to illustrate them with a bar chart, which would require graphics. The result comes together through desktop publishing. No matter which of these office automation software applications you use, or even if you use them in an integrated office software (IOS) package, there are now X Windows-based packages to from which to choose.

Take It From The Desktop

Let's start with desktop management software. Packages like Visix's Looking Glass, IXI Ltd.'s X.desktop, and Quest Systems' XDesk are designed to bring a Macintosh-like graphical user interface (GUI) to the monitor of the UNIX user. The goal is to hide UNIX from the neophyte who thinks that command lines are what George C. Scott barked in *Patton*.

Now users will see icons that logically represent what is behind them, such as a filing cabinet for documents. Users can also define the point-and-click icons themselves. The theory is that someone just getting computer training, a frequent activity in corporate America, can become UNIX-literate more quickly.

IXI has also helped bring other software packages to the desktop with its X.deskterm software. X.deskterm lets developers devise an X Windows-based interface to character-based software so users get the advantage of multiple windows without waiting for the developer to create an X-based application from the ground up. Regardless of whether developers own the source code of the character-based application, they can use X.deskterm to build the interface. Uniplex, for instance, used IXI's software to devise its X-based version of its own IOS package. Altered Image used

JOHN GREENLEIGH

X.deskterm to build an X-based interface for Informix's database.

In addition to Uniplex's IOS, users will find most IOS packages that have been released in the last six months are X Windows-based, including Quintet's Dux, BBN Software's BBN/Slate, Clarity's Rapport, and Applix's Asterix (Applix's previous IOS, Alis, also runs under X Windows). All take advantage of the X Windows capability for cutting and pasting between windows, known as "screen capture."

BBN/Slate, Rapport, and Asterix have extension capabilities that let system administrators or system integrators integrate other programs into the software. Their differences lie in the size of the foundation you plan to build. With word processing, graphics, and a spreadsheet, for example, Asterix allows the flexibility to incorporate other applications.

Clarity's Rapport goes one step further in what it provides, incorporating word processing, graphics, a spreadsheet, and mail and fax server capabilities. In addition, it offers a document exchange capability that lets users send files to Macintosh and PC users. Recipients can, in turn, edit those documents and send them back to the UNIX workstation.

Of the three, BBN/Slate has incorporated the largest catalogue of features, including geometric and freehand drawing in its graphics module, audio capability, document publishing capabilities in its word processing module, and the ability to edit color or black-and-white images that have been scanned into the system or captured from the screen.

Users will find most IOS packages released in the last six months are X Windows-based

If you do not want your X Windows-based applications integrated, several word processing, spreadsheet, and graphics packages are available as standalone applications. Lotus, WordPerfect, and Ashton-Tate all have X Windows applications development under way for their flagship products. Other standalone products include Informix's Wingz graphical spreadsheet, which originated on the Macintosh; Island Graphics' IslandWrite, IslandPaint, and IslandDraw; and QSP's Exclaim.

QSP's Exclaim was the first purely UNIX spreadsheet package to take advantage of windowing, mouse support, dialog boxes, and pull-down menus. Exclaim's development started with MIT's X.10, with the final version based on X11R3. It combines the feel of Lotus 1-2-3, with which it is compatible, with the look of Excel, Microsoft's Macintosh spreadsheet.

For a run around the databases, the Altered Image opens the X window to Informix. Empress Software's DBMS (database management system) and 4GL are all X-capable, and Robinson-Schaffer-Wright offers Xve, an X Windows-based view into its /rdb database.

Publishing, Workgroup Options

Just as many X Windows-based office automation applications summon data from hosts across the network, so does desktop publishing. If you're doing a newsletter or brochure, you're likely to import data from a variety of departments and sources and cut-and-paste them across X Windows for a snazzy finished product. Many of the biggest contenders in the desktop publishing market are X-based, including Interleaf's TPS and Frame Technology's FrameMaker, Elan's Avalon, and Arbortext's The Publisher. Marc Software's WordMarc Composer+ straddles the line between word processing and desktop publishing.

One of the first software applications to take advantage of the X protocol's independence for the workgroup is Crosswind Technology's Synchronize. Its group scheduling software runs only on X Windows-based terminals, PCs, and workstations, and keeps track of the schedule of everyone in a department. You can set up meetings with colleagues without having to check when co-workers are free and then figure out a chunk of time. With Synchronize, users can view through windows the schedules of both people and resources, such as conference rooms, to see when they're free. It can also be used to distribute agendas and reminders. (For more details, see our review in last month's issue.)

If the X Windows-based application market takes off as expected, Synchronize may be in the vanguard of a deluge of X Windows-based applications specifically designed for the workgroup. But that is the future. In the here and now, you can use these applications with network systems to achieve the operating system independence that X delivers. ■

Selected X Office Software Developers

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Clarity Software 2700 Garcia Ave., Mountain View, CA 94043; 415-691-0320
Crosswind Technologies 6630 Highway 9, Ste. 201, Felton, CA 95018; 408-335-4988
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Empress Software 6401 Golden Triangle Dr., Ste. 220, Greenbelt, MD 20770; 301-220-1919
Frame Technology 1010 Rincon Circle, San Jose, CA 95131; 408-433-3311
Informix Software 4100 Bohannon Dr., Menlo Park, CA 94025; 415-926-6300
Interleaf Prospect Place, 9 Hillside Ave., Waltham, MA 02154; 617-290-0710
Island Graphics 4000 Civic Center Dr., San Rafael, CA 94903; 415-491-1000
IXI Ltd. 62-74 Burleigh St., Cambridge CB1 10J, England; +44-223-462131
Quality Software Products 5711 W. Slauson Ave. Ste. 240, Culver City, CA 90230; 213-410-0303
Quest Systems 2700 Augustine Dr., Santa Clara, CA 95054; 408-496-1900
Robinson-Schaffer-Wright 131 Rathburn Way, Santa Cruz, CA 95062; 408-429-6229
Visix Software 11440 Commerce Park Dr., Reston, VA 22091; 703-758-2700

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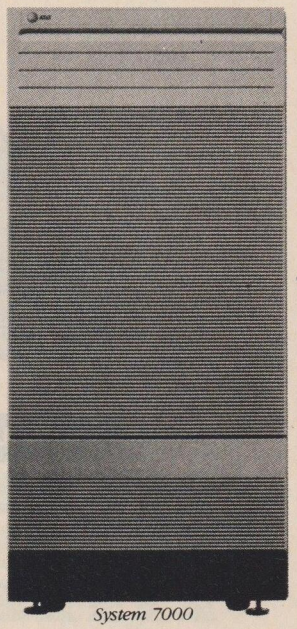

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It delivers 200+ transactions per second and from fourteen to 168 MIPs in modular, cost-effective increments. It supports from one to twelve RISC CPUs. It runs UNIX® System V and complies with a host of open networking protocols, including a new parallel version of our award-winning StarGROUP™ software. It's the AT&T System 7000, and it brings scalability and superior performance to your most vital business applications.

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	AT&T SYSTEM 7000 MODEL 7080	DEC® VAX 6000 MODEL 500	H-P®9000 MODEL 870	SEQUENT® SYMMETRY S81
#CPUs	1-12	1-6	1-2	2-30
TPS (Oracle TP1 benchmark)[1]	208+	151	N/A	205+
Max Memory	512 MB	512 MB	768 MB	384 MB
TPS (Informix® TP1 benchmark)	201	N/A	N/A	175[1]
CPU Performance Range	14-168 MIPs	13-72 VUPs	53-100 MIPs	10-150 MIPs
Disk Storage	128 GB	5 TB+	85.76 GB	44.3 GB
Ethernet® Channels	12	6	N/A	4

Customers choose System 7000 for its high degree of scalability.
[1]Source: Cobb and Date

For immediate additional information on the powerful, flexible, scalable AT&T System 7000, call us today at 1 800 247-1212, Ext. 981.

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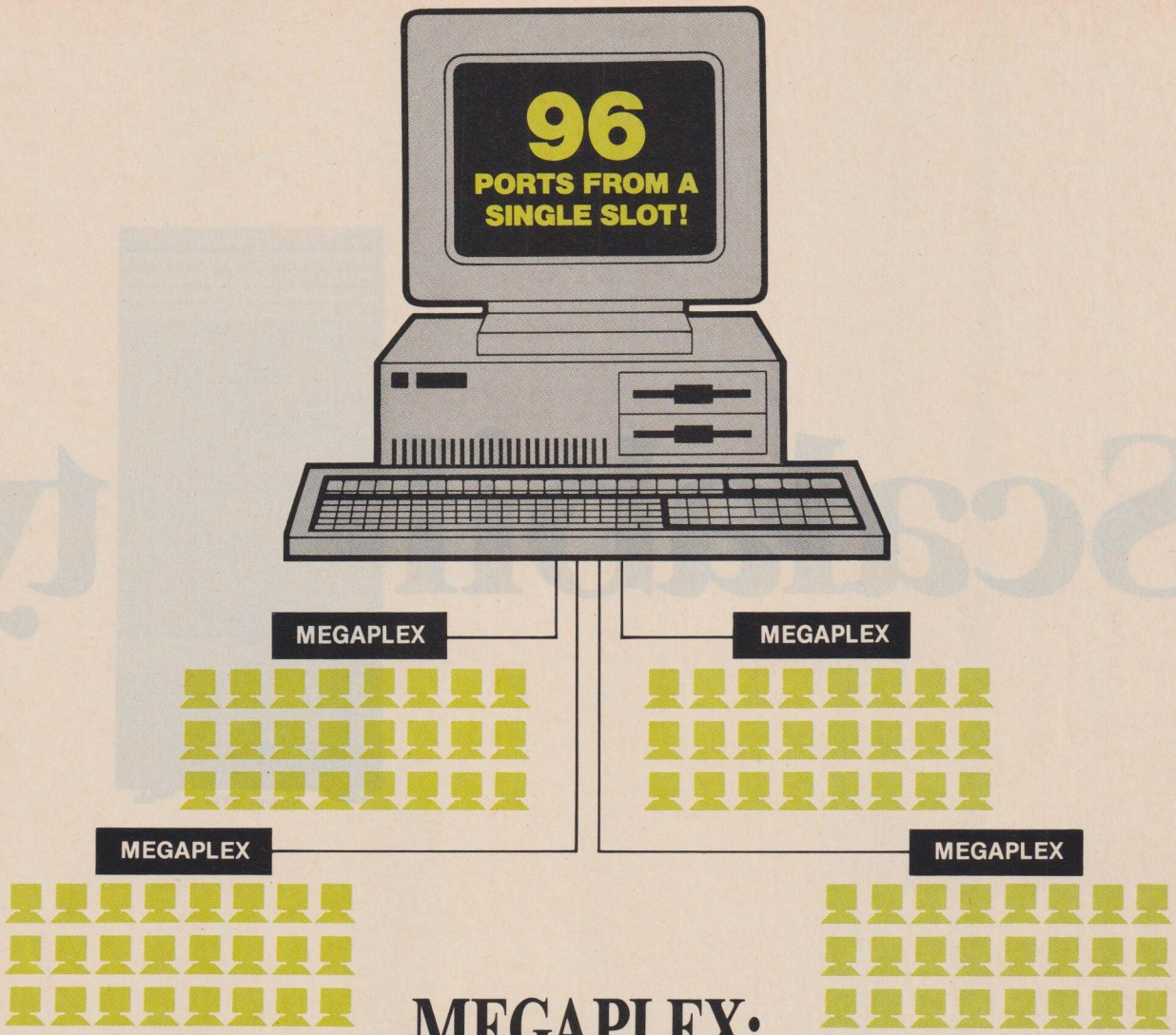

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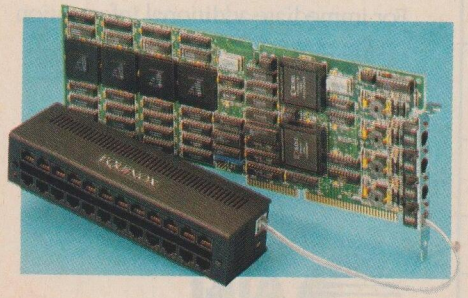

It consists of a single card that supports up to four 24-port cluster multiplexers, each of which can be located up to 2500 feet from the computer. You can start with 24 ports and add users, printers and modems by connecting extra cluster multiplexers for 48, 72 and 96 ports. Install as many as 8 MEGAPLEX controllers in a single computer for up to 768 ports.

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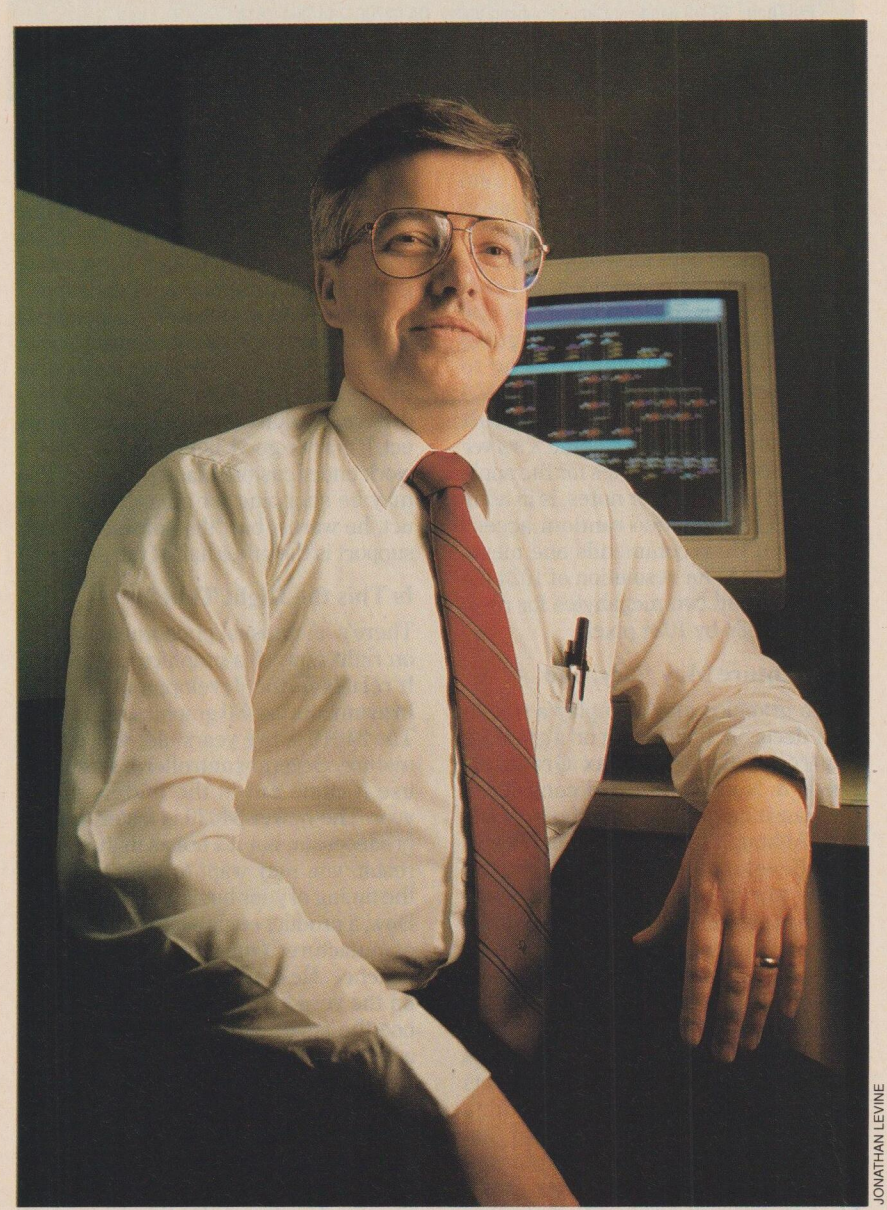
Choosing a Board For Speedy Graphics



JONATHAN LEVINE

Rich Boyd evaluated graphics controllers using a two-step process: he set up various configurations and developed benchmarks that applied to his intended applications.

The right controller board can make your graphics applications hum. Now, how do you test for it?

By Howard Baldwin

When Rich Boyd set out to test graphics controllers for his company's UNIX-based PCs, it was a complicated two-step process. As program manager for Leeds & Northrop, a manufacturer of industrial and energy-management process control systems in North Wales, Penn., Boyd was first responsible for setting up various configurations of PCs and controllers. Second, he developed a suite of in-house benchmarks related to his process control application to help determine the performance of the various configurations.

The evaluation took a lot of work, but graphics files take up a lot of space on your disk. Think of graphics files on your workstation or PC as a gargantuan dinner buffet–it looks great, but the more you partake, the slower you move. To put all of those pretty colors on a display takes lots of power, and this is where graphics controllers come in. If you can make the graphics move and draw faster, and thereby make users more produc-

tive, the choice of a graphics controller becomes very important.

These board-level products are compatible with either VMEbus or AT-bus specifications. They off-load the intensive processing of graphics from the primary CPU by using on-board graphics processors, such as the Texas Instruments 34010 (or its new second-generation chip, the 34020) or the Intel 82786 processor. You may also find dynamic random-access memory (DRAM) on-board to assist the processor further.

Buses and processors wrap up the key hardware compatibility issues. Major manufacturers of graphics controllers include Artist Graphics, Imagraph, Matrox, Megatek, National Design, Parallax Graphics, and PsiTech. Next you'll need to consider the bus, the resolution of the monitor, the on-board processor, and the amount of RAM on the board. The last two are most important because they directly affect the speed of drawing graphics on the screen.

There are, however, software issues as well. For instance, are standard toolkit libraries available from the manufacturer for its particular controller? Because more work is done using X Windows-based applications, some application developers and manufacturers are using graphics controllers not just to speed up graphics, but to speed up X Windows performance. As a result, you have to be concerned with X server compatibility.

How much color capability you desire will determine whether you buy a graphics controller that will support 256 colors or grayscale. Also look at which graphics co-processor standards the board supports, such as TIGA (Texas Instruments graphics architecture), designed to work with TI's 340X0 processors; or Graphic Software Systems' Dgis (direct graphics interface standard), designed to be device independent. Those are the simple questions. After that, let the testing begin.

Your Results May Vary

If there's one common piece of advice that users echo, it's to test the board under real-world conditions as close as possible to the way you would use it after it's purchased. Boyd warns, "Every board's got its own anomalies, and there's no way to predict them. You can't really determine the real speed [of a controller] until you see it running with your application."

Even on Leeds & Northrop's development platform, Boyd notes that speed is important, particularly when it comes to certain X functions such as `XCopyArea`. In this instance, consider how much on-board memory the controller has. If the board doesn't have enough memory to draw off-screen pixels (the windows just off the screen that can be moved onto the screen as you desire), the CPU has to take care of drawing the pixels off-screen. Boyd warns, "That's incredibly slow."

J.B. Danziger, vice-president of Ferro Tech Industries, a Houston-based systems integrator, adds, "If you're going to run the X server, you're going to need at least four megabytes of DRAM on the board, because it takes at least two megabytes of DRAM for the X server and at least two megabytes for the application." This, Danziger notes, is in addition to VRAM (video random access memory). He recommends one megabyte of VRAM for resolution of 1024-by-768 pixels and two megabytes for resolution of 1280-by-1024 pixels.

Your Future May Vary, Too

Video graphics may also play a role in your decision. In deciding on a graphics controller from Parallax Graphics, Leeds & Northrop's Boyd considered the transition of video onto the workstation. Although it isn't crucial in his current development environment, the ability to run real-time video in a window has potential among the industries his company targets, including public utilities, steel manufacturing, and waste water treatment facilities. As a result, he wanted that capability on his controller.

You may choose to find a graphics controller manufacturer whose products are already deemed compatible with a display controller. That is, a card that speeds up the display capabilities on your screen, unrelated to X Windows. James Lu, a systems engineer with American Systems, a systems integrator in Chantilly, Va., primarily dealing with Defense Department contracts, is frequently involved with multimedia projects.

Lu was concerned that the graphics controller work smoothly with the video controller, the card that takes care of "frame grabbing," or putting a complete set of pixels on the monitor at once. He recommends that if you know you're going to be using both, buy both from the same manufacturer. "If you buy the [graphics controller], and then look for a frame grabber, that's nothing but headaches."

Lu also stresses the value of looking at graphics libraries that are compatible with the controllers. "We're looking for vendors that already have some tools and device drivers. We don't want a brand new product. It may be good, but we have to have it work under custom-made software." You may be shopping for a hardware product, he warns, but "the software library support is the other half of the product."

Is This the Right Time?

There's an unusual phenomenon going on right now with graphics controllers. It relates to the development of Texas Instruments' 340X0 graphics chip family. The 34010 is five years old, so it's quite mature. Several controller boards that use it came out in the middle of last year. The newer 34020 is faster than its predecessor, but it's not as mature. As a result, you may want to look closely at the timing of your buying decision. Mike Dow, a product engineer for workstation manufacturer Opus Systems, counsels patience. He sees a lot of manufacturers on the verge of releasing products that use the faster 34020 chip, but cost less and have more built-in features.

Ultimately, though, your buying decision revolves around the environment in which you'll be running the application. This environment encompasses the board itself, as well as compatible hardware and software. Decide how much on-board memory is required for your graphics to perform adequately without needlessly compromising the CPU. What other controllers, display or video might it be working with, and how well do they work together? Finally, look at what standard software toolkits are available for your graphics controller. ■

Selected Graphics Controller Vendors

Artist Graphics 2675 Patton Rd., St. Paul, MN 55113; 612-631-7800
Imagraph 11 Elizabeth Dr., Chelmsford, MA 01824; 508-256-4624
Matrox 1055 St. Regis Blvd., Dorval, Quebec, Canada H9P 2T4; 514-685-2630
Megatek 9645 Scranton Rd., San Diego, CA 92121-3782; 619-455-5590
National Design 9171 Capital of Texas Hwy. N., Ste. H-230, Austin, TX 78759; 512-343-5055
Parallax Graphics 2500 Condensa St., Santa Clara, CA 95051; 408-727-2220
PsiTech 18368 Bandilier Circle, Fountain Valley, CA 92708; 714-964-7818

This list contains contact information only for those vendors mentioned in this article and is not intended to represent all the vendors in this market.

High Praise.

Lantronix's combination of LAT and TCP/IP connections, small size, command enhancements and reasonable price make this a noteworthy terminal server.

Using the ETS-16, you can provide services to both LAT and TCP/IP hosts. The unit doesn't care which type of host uses a service, and it can queue LAT and TCP/IP print jobs to the same service simultaneously.

It's well suited for workgroup configurations in which connectivity with VMS and UNIX is essential.

Installing the ETS-16 is straightforward.

Anyone familiar with a DECserver can configure a Lantronix terminal server with little trouble.

Beyond simple connections, the ETS-16 can translate between LAT and TCP/IP TELNET protocols. In the simplest form, this allows you to connect to both VMS and UNIX systems from the same terminal.

Lantronix also adopted the UNIX finger command... these commands are excellent enhancements.

Quotes from DP Labs test report published September 1990 in DEC PROFESSIONAL Magazine.

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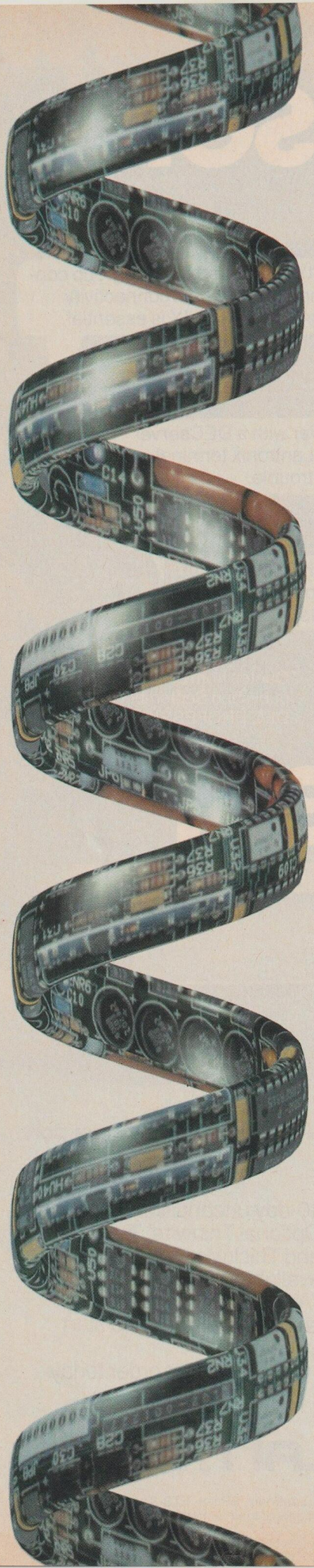

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THE NAME BEHIND THE VOICE

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DATA GENERAL'S UNIX PRAYER

By Rik Farrow

The proprietary era is gone. The Aviion 402 must succeed for Data General to live on

Data General's Aviion systems have been around for close to two years, but they have shared the fate of other Motorola 88000-based systems: a scarcity of applications. But today, with increasing numbers of 88000 programs, as well as DG's support for the X Window System and OSF/Motif, it looks like Data General's software blues are over. Now all it has to do is make its pricing structure more realistic.

Our case in point is the Aviion 402 workstation, the souped-up version of the entry-level Aviion 400. Although the 402 is the only dual-processor system to sell for under $20,000 in the UNIX market, it is unlikely to compete in engineering and science environments.

The biggest problem facing DG is cultural. It has literally staked its future on becoming a UNIX vendor, but its pricing policies are influenced by its proprietary Eclipse/MV business. To be sure, DG has lowered its prices compared to the Eclipse/MV structure, but it hasn't lowered them enough. Even in Dhrystone mips comparisons, which DG is fond of drawing, the trend is clear: a 14-mips MV/40000 weighs in at $35,000/mips; a 34-mips Aviion 402 at $577/mips; and a 60-mips 486 server from any number of Intel vendors at about $400/mips.

DG can get away with higher pricing because its existing customers like

JOHN GREENLEIGH

Targeted at traditional Data General marketplaces, the Aviion 402 is a souped-up version of the entry-level 400 and the only dual-processor system to sell for under $20,000 in the UNIX arena.

their relationship with DG, but the attitude spills over into pricing for system components. For example, the 150-megabyte tape drive for the 402 sells for $1,895, about $300 more than a tape drive for Sun's SLC. Even more outlandish, the 622-megabyte hard disk in the 402 sells for $8,400, even though you can buy a 600-megabyte SCSI drive from a disk vendor for about $1,800.

When I finished specifying my review unit, I had ordered quite an expensive system. The base unit had a price tag of $19,605 and came with two 16-MHz 88100 processors (each with 32 kilobytes of cache), eight megabytes of memory, a 662-megabyte hard disk, an SCSI port, a thick Ethernet card, two serial ports, one parallel port, and two VMEbus slots. The additional components I specified raised the price to $38,795. My setup included a 150-megabyte tape drive, 8-bit color frame buffer, and an extra 16 megabytes of memory. DG charges an additional $800 for DG/UX, its port of System V 3.2.

As for performance, The 402 turns in a SPECmark of 8.7, which reflects the performance of a single processor. Even when doubled (which would be unlikely even if the SPECmark could measure a dual-processing system), the Aviion falls short of the IBM RS/6000 POWERstation 320, which turns in a SPECmark of 22.3. On the other hand, the Aviion scores relatively well on the SPECthruput test with mark of 15.4.

Data General is expanding VAR connections to attract new commercial customers

Fortunately for DG, it is not squaring off against the IBM RS/6000. Instead, it is offering its traditional customer base the option of purchasing Aviions. Typical markets for DG include legal and medical offices, the federal government, geological survey and mapping, retail, and corporate DP/MIS where DG competes with IBM, Digital Equipment Corp, Wang Laboratories, and Prime Computer. In these markets, service and support considerations mean vendors can charge more for their systems.

DG is also expanding value-added reseller (VAR) connections to attract new commercial customers. Its marketing strategy revolves about its Aviion 4000 and 5000 servers, which fill the role of department- or company-wide machines. Depending on the environment, these servers interact with ASCII terminals, X terminals, workstations from other vendors, or Aviion workstations such as the 402 or inexpensive models from the 200 and 300 series. DG's most inexpensive workstation is PC-priced: $3,995 for a diskless Aviion 100.

The 402 Up Close

The 402 stands well short of desk height, at 24 inches high, 5 1/2 inches wide, and 22 inches deep. The three fans on the bottom of the cabinet actually make less noise than the hard disk drive–the 402 is a quiet computer. The front panel has a opening for the one-third-height 150-megabyte tape drive. The power switch is prominently positioned, perhaps too prominently because it is possible to power-off the system with your knee when you are sitting down.

Large panels, held on by easy-to-use screw-headed latches, cover the sides and top of the 402. The full-height hard drive sits at the top of the unit, near the back, with room for two one-third-height 5 1/4-inch drives in the front, both with knock-out panels for front access. The power supply takes up most of the right side of the chassis below the disk area, except for two VMEbus slots near the lower back. These VMEbus slots are standard on the 400 line and are 6U form factor. The VMEbus is DG's way of providing an open systems hardware interface that is important to many VARs and OEMs (original equipment manufacturers).

The entire left side of the chassis contains a very large PC board that holds one CPU, eight memory connectors, the VMEbus interface, the SCSI interface, the serial and parallel ports, and the Ethernet. In dual-processor models, such as the 402, a daughterboard containing the 88100 and two 88200 CMMU (cache memory units) attaches above the first CPU. The graphics option also rides on a large daughterboard. When you compare this design with a SPARCstation or DECstation, you are immediately struck by how large everything is. Each equivalent SPARCstation module is about one-quarter the size of its DG counterpart. I guess this comes from having built minicomputers for so many years.

DG and UNIX

DG ported System V to its Eclipse/MV minicomputer in 1984. Work began almost immediately on the creation of a multiprocessor variant of the kernel that would be fully symmetric. Fully symmetric multiprocessing requires that each processor share the same memory and image of the kernel, and that no task, such as I/O, is linked to a special processor.

DG's kernel programmers decided that an object-oriented kernel would be more suitable to solve the multiprocessor problem, so they redesigned the UNIX kernel. They did not like, for instance, the way in which any portion of the kernel could access and modify certain global data structures, such as the process table. They broke the process table up into several related pieces and put each piece into a module that had the only access to the piece. This

REVIEW HIGHLIGHTS

Aviion 402
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Westboro, MA 01580
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A reliable system with many applications, worldwide support, one of the quietest workstations on the market.

Questionable price/performance ratio, add-on hardware expensive.

List price: *16-MHz clock, with eight megabytes of memory, and 662-megabyte hard disk: $19,605. With 8-bit graphics, the system sells for $25,100.*
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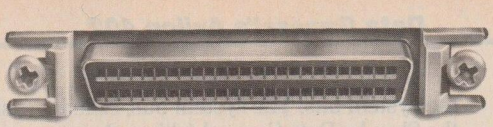
Warranty: *90 day parts and labor.*



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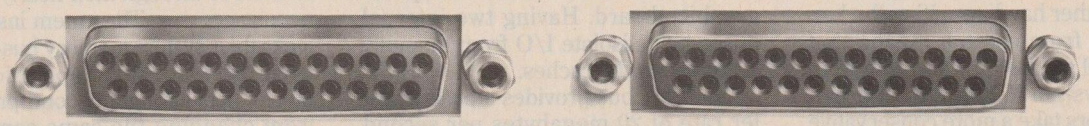

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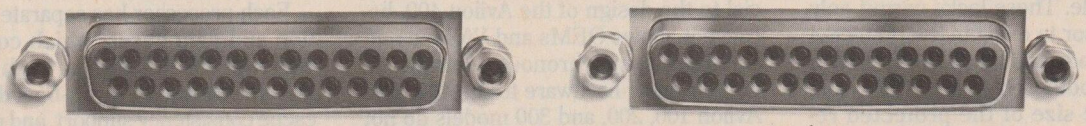

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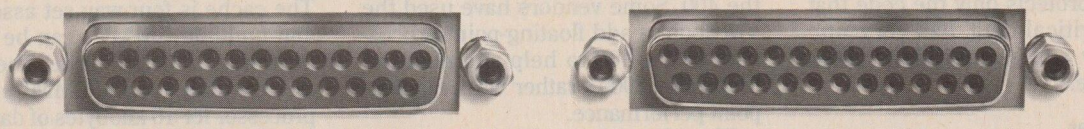

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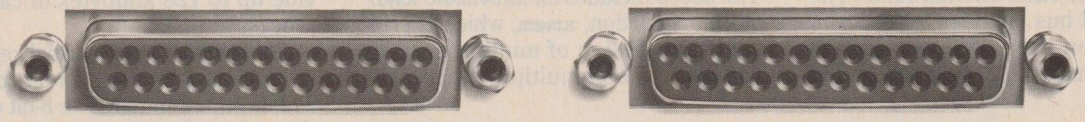

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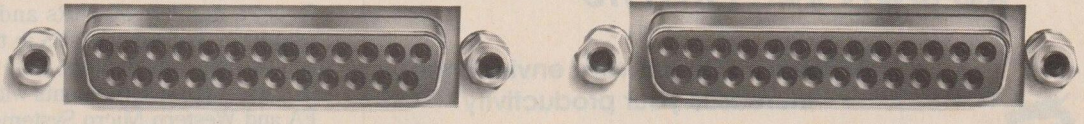

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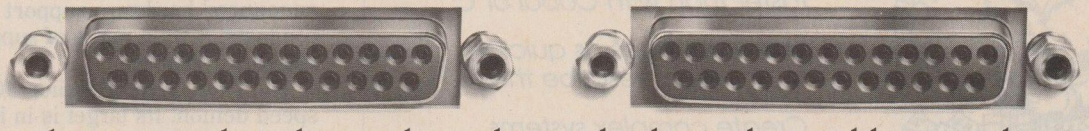

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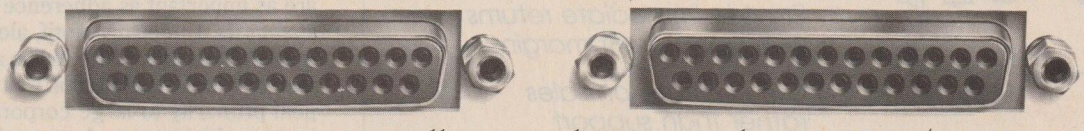

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object-oriented technique is called data-hiding and data-encapsulation, and really helps in the design of a multiprocessing kernel.

On the other hand, rewriting the kernel almost from scratch means that DG's kernel will be very different from the new System V Release 4 kernel. Most vendors take a more conservative approach to multiprocessor kernels by putting "locks" around certain critical areas of code. These locks permit only one processor to execute the protected portion of code and this is the approach taken with both OSF/1 and SVR4. The smaller the size of the protected regions, the higher the granularity and the better the performance. DG's kernel, which protects only the code that modifies critical data, has very fine granularity and should show great performance.

Three Buses

Besides the VMEbus, the 400 series possesses two other internal buses. The Motorola M bus provides a fast 32-bit bus between the processor caches (CMMUs), main memory, graphics, and the system bus. The system bus, called the Sbus by Data General (although not related to Sun's SBus), provides a 32-bit bus between all I/O devices except the graphics board. Having two internal buses helps isolate I/O from memory accesses via the caches.

The VMEbus provides a peak transfer rate of 20 megabytes per second between system memory and the VMEbus boards. The VMEbus is crucial to the design of the Aviion 400, because it allows OEMs and VARs to add serial ports, synchronous communication, or other hardware to the 400. The Aviion 100, 200, and 300 models do not have VMEbus slots, while the higher-end Aviion models have more slots than the 400. Some vendors have used the VMEbus to add floating-point processors to the 400 to help augment the Motorola 88000's rather weak floating-point performance.

The Motorola 88000 lends itself to multiprocessor designs such as the 402. The 88000 includes an indivisible load/store instruction, **xmem**, which is critical in the design of multiprocessing software. When multiple processors share the same memory and run the same kernel, they must communicate reliably to prevent destroying data structures through their nearly simultaneous accesses. The xmem instruction locks their system memory bus (M bus) until the load/store operation completes, preventing a second processor from changing the same semaphore (multiprocessing flag) while the load/store is in process.

Each processor has separate instruction and data buses, which communicate with 88200 CMMUs. Each CMMU has 16 kilobytes of on-board cache, cache consistency support, and memory management on board, making it easier to design multiple processor systems. The cache is four-way set associative, and multiple CMMUs can be used to provide for a larger cache. The 400 series uses only a pair of CMMUs for each processor for 16 kilobytes of data cache and 16 kilobytes of instruction cache. Other higher-end Aviion products provide up to 128 kilobytes of cache per processor.

The Aviion 400 supports three graphics options: 8-bit color, 24-bit color, and 24 bits with Z-buffer. The 8-bit color on the reviewed workstation exhibits very good text display performance, but only fair graphics performance. DG claims that the next release of X Windows for the Aviion, X11R4, will show performance improvements.

Will Data General attain a modicum of success with the Aviion 402? I think so. Data General is using three channels to sell Aviions: its own direct marketing force, a number of VARs and OEMs who have worked with DG in the past, and two large distributors. Data General has also signed agreements with Gates FA and Western Micro Systems as distributors. Data General also has worldwide hardware support, and recently announced hardware support for Sun products. A wide range of support options are available.

The Data General Aviion 402 is no speed demon. Its target is in its traditional marketplaces, where reliability, service, and familiarity with the vendor are as important as adherence to open standards. Choosing Motif, along with System V, also gives the Aviion an edge, and makes it a workstation that may appeal primarily to large corporate customers who can get a better price from Data General. ■

Editor-at-Large Rik Farrow is a software engineer, and author of a book on UNIX system security. He teaches courses on system administration and system security.

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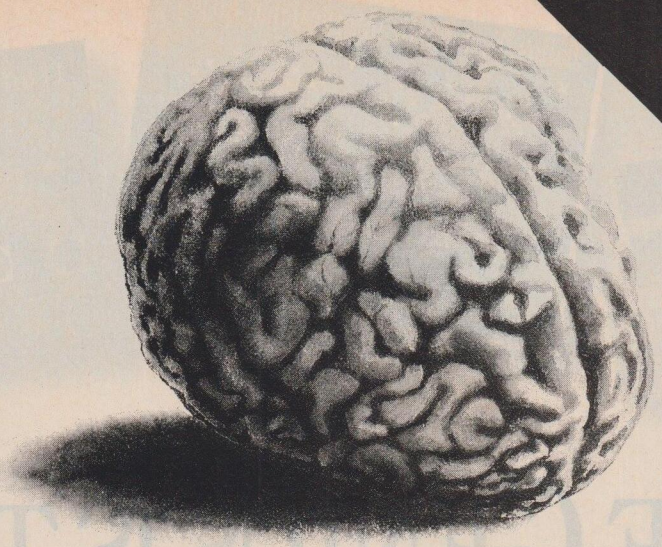

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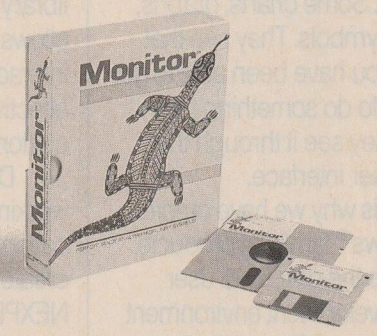

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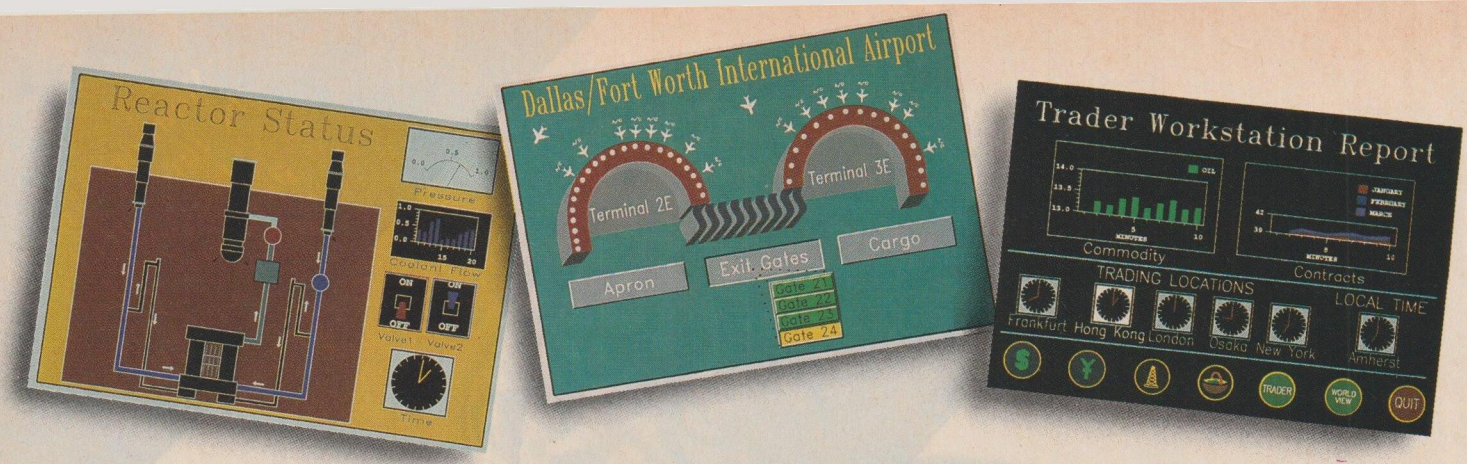

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CIRCLE NO. 57 ON INQUIRY CARD

PAINTING IN UNIX

By Scott Raney

How does a UNIX paint program stack up against the Mac alternatives?

If the painting tools in your word processor or desktop publisher won't let you edit a complex image or create the logo you want, you need a standalone paint program. In UNIX, if you scour the bushes, you may encounter some high-end image processing software, but you will generally run into Island Paint and Artisan. You'll also run into a lot of advice to buy a Macintosh. But if that's not in the budget and you're devoted to UNIX, Artisan from Media Logic is a worthy alternative.

Compared to Macintosh paint programs (Digital Darkroom, Photoshop, and Studio/8, to name a few), Artisan pales. Especially noticeable is the omission of advanced image editing, animation tools, and drivers for popular scanners. Also disconcerting is Artisan's inability to draw continuous brush strokes. But compared to popular DOS programs such as PC Paintbrush and Dr. Halo, Artisan is a cut above. Its strongest feature is its robust set of painting tools, including cut-and-paste templates and anti-aliasing, which reduces the jagged edges, or jaggies, that frequently occur on low-resolution monitors.

Unfortunately, Artisan is expensive. The monochrome version of Artisan for SunView sells for $495. That's reasonable by UNIX standards, but black-and-white output can be as limiting as some DOS programs. The gray-scale and color versions at $995 and $3,250, and the color version for the X Window System at $5,250 are eminently more useable, but priced too high. Comparatively, Island Graphic's Island Paint sells for $395 per user for X versions, and most Apple paint programs fall in the $500 to $900 range per CPU.

Artisan is relatively new. It has been on the market for about 14 months and has developed a following among

Artisan's cut-and-paste facility allows composite art (left, top) to be created from photographs (left, bottom) and images created using Media Logic's 3-D renderer (above).

PHOTOS COURTESY OF JOHNSON FAIN PERIA

FrameMaker users. Island Paint is six months older and has been successful in the vendor's Island Write/Paint/Draw trilogy, which combines desktop publishing, drawing software, and painting software. Drawing software uses graphic instructions to store and display objects. Painting software uses the actual bits in the image.

For this review, I used the SunView version of Artisan on a SPARCstation 1 and a Sun 386i, both with 8-bit color displays and 8 megabytes of memory. Installation was easy. The product comes with a simple installation script. The SunView version includes binaries for all three Sun architectures (SPARC, 680X0 and 386). The three binaries can be maintained on a single file server if necessary; otherwise, the installation script removes the unneeded versions. To support a single architecture, about 16 megabytes of disk space is required, including seven megabytes for sample images.

To Draw or Paint?

Illustration software commonly falls into one of two categories, namely paint and draw programs. Paint programs such as Artisan operate on the bits in an image. You can either create an image freehand in a paint program, or import it from a scanner or video frame grabber. Editing the image consists of changing the color of individual pixels in the image, although you can change groups of pixels simultaneously–a much harder task.

Media Logic claims Artisan is a complete solution for a multitude of illustration needs

Paint programs are most useful when precise control over color, shading, and texture is required, such as when operating on scanned images to produce logos or figures for four-color advertising flyers. Creating an illustration with a paint program is a time-consuming process. Although you can match colors to pixels, once you color a pixel it can be difficult to change it a second time without changing neighboring pixels. Paint program images are also large. A full-page image at laser printer resolution (300 dots per inch) has a file size of about one megabyte for a monochrome image and 22 megabytes for a 24-bit image.

Drawing packages, as well as the essentially similar CAD packages, provide a selection of objects (circles, lines, text) that you can select, size, color, and rearrange. Because these objects are built with graphic instructions, drawing packages are sometimes called "object-oriented" packages (not to be confused with object-oriented databases or programming languages). The bottom line is that you can create and edit an object, such as a square or triangle, almost instantaneously. In a paint package, you can often build object quickly, but you can't edit them easily.

Media Logic claims that Artisan is a complete software solution for a multitude of illustration and layout needs. This is possibly true, but it is certainly not the most efficient solution. For most illustrations, especially those that have large amounts of text, a drawing package (such as the graphic editors in the Interleaf and FrameMaker DTP packages) is the way to go.

The Tools

Artisan has the usual drawing tools as well as a few not commonly found in paint programs. One of these is the ability to draw anti-aliased lines and text. The anti-aliasing feature is a good way to use color or gray-scale to improve the quality of output without increasing resolution.

Another notable feature is Artisan's ability to use already created objects, or any part of them, as templates for cutting and pasting areas within the image. While probably not as useful as the lasso tool common to Macintosh paint programs, this feature does provide a way to scale and rotate arbitrary areas.

Artisan's color and pattern selection mechanisms are standard fare. Artisan lets you edit brush shapes and patterns and then store them in a file. The brush tool operates in an unfamiliar manner, however. Rather than producing a continuous line when the mouse is moved, the brush shape is only put into the image intermittently. This makes drawing smooth shapes and filling areas rather difficult. Although performance would suffer if Artisan supported standard brush behavior, Media Logic should have included it as an option.

Media Logic recommends 16 to 24 megabytes of memory along with a generous swap partition for editing large color or gray-scale images. On my two Sun review systems, performance was marginal when editing large images, because the amount of data I/O resulted in constant thrashing of the virtual memory system. Unfortunately the color version of Artisan only produces 24-bit images. An 8-bit color version (at a more reasonable price) would be a welcome addition the product line.

Clearly the 8-bit gray-scale version of the program is the best value because it costs two-thirds less than the color version and is much faster. What's more, most users output to laser printers, which can only produce gray-scale out-

REVIEW HIGHLIGHTS

Artisan
Media Logic Inc.
17351 Sunset Blvd.
Pacific Palisades, CA 90272
213-573-7575

Powerful, full-featured painting application. Good distribution and licensing policies. Good documentation and telephone support. Reasonable pricing for monochrome and gray-scale versions.

Not up to the functionality, performance or ease-of-use standards of Macintosh-based paint programs. High cost for color version.

Version: *2.1*
Systems: *Sun 386i, Sun-3, Sun-4, SPARCstation 1, SPARCstation 2, SPARCstation IPC, HP 9000/300 series, Sony News, Silicon Graphics 4D Series, Tektronix XD/88*
Requirements: *SunView or X11R3, 8 megabytes RAM, 16 megabyte disk.*
Price: *$495, $995, $3,250 for monochrome, gray-scale and color for SunView, $5,250 for color X version. Multiple copy and educational discounts available.*
Support: *12 p.m. to 8 p.m. (EST). Half-hour free telephone support good for first 90 days. Extended support and maintenance available at extra cost.*
Warranty: *3 months.*

put. The program reads and saves files in the SunView standard format, TIFF and Targa formats, and a couple of Artisan-specific formats.

Documentation for Artisan comes in a standard-sized, three-ring binder. The manual has three parts: installation, user's guide and reference. It is complete and well-organized, although a few mistakes in the index and some fuzzy screen dumps beg to be fixed. Artisan is Media Logic's flagship application, and I found that the quality of their technical support shows the vendor is committed.

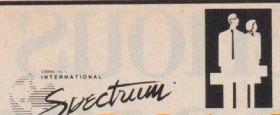
Certainly, with the easy free trial-use policy, Artisan is worth investigating

But Is It Worth It?

If you're interested, you can try Media Logic's free trial version of Artisan. To get it, just send them a blank tape and specify your hardware platform. Media Logic returns a copy of Artisan with the save option disabled. Documentation is also included in the form of PostScript files on the tape. If you decide to buy it, Media Logic supplies a password to enable the save option.

If you need to merge scanned images or detailed artwork into your documents, and you already work on a supported UNIX system, Artisan might be a useful tool. Certainly, with the easy trial-use policy, it's worth investigating. But, if you edit scanned or video images on a regular basis, Artisan is too limiting, and you should invest in a Macintosh and a program such as Digital Darkroom, Photoshop, or Studio/8. ■

Scott Raney has designed and coded several window-based applications including GEM Paint and Publishers Paradise, an X11/Motif interface to text and graphics stored on CD-ROM. He currently does part-time consulting work while working on his doctorate at the University of Colorado, Boulder.



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CIRCLE NO. 252 ON INQUIRY CARD

DBASE COMES TO UNIX

By Rick Farris

Ashton-Tate ports the most widely used relational DBMS product in the DOS world

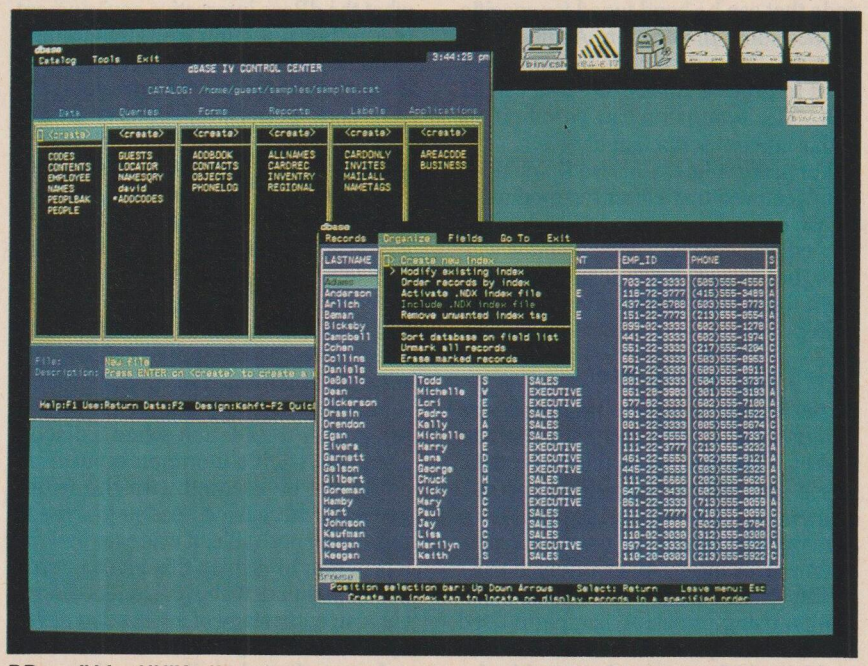
The arrival of dBase IV in UNIX is a historic event. It makes Ashton-Tate a legitimate UNIX vendor and provides the missing link for businesses committed to using popular DOS applications. Several months ago we saw Lotus bring 1-2-3 to UNIX, and WordPerfect has been around for a long time, so dBase IV makes it a software trifecta. No one expects businesses to chuck their PCs, but dBase IV opens many possibilities for developers and DP/MIS shops.

Ashton-Tate faithfully reproduces its relational database management system (RDBMS) in dBase IV for UNIX. The product offers all the components from the DOS version, including the SQL interface, and screen, report, and application generators. While there are other "dBase in UNIX" products–Recital, FoxBase, Quicksilver, and dBman come to mind–none offers the DOS-to-UNIX transparency of dBase IV, although Recital has a significant enhancement, a data dictionary. DBase for UNIX's major shortcoming is that it does not fully integrate its SQL with dBase IV programming interfaces.

Ashton-Tate's entry into UNIX is significant because it and Borland International were the two major DOS holdouts going into 1991. In this light, it is easy to dwell on cross-platform development of dBase IV applications. But dBase IV should be judged as an RDBMS in its own right–it is that powerful. Moreover, dBase IV offers off-the-shelf interfaces for the full range of database manipulators, including data entry personnel, management types familiar with methods to query databases, database designers, 4GL programmers, and application designers.

The initial version of dBase IV for UNIX was released for SunOS running on the Sun-4, SPARCstation, and SPARCserver. I preferred working under the SunView windowing environment, but dBase IV runs equally as well on the console or terminal, but not under Sun's Open Windows windowing system. DBase IV is a full multiuser product, although it can be bought with a single-user license. In January, Ashton-Tate also began advertising dBase IV for SCO UNIX and XENIX, and Interactive UNIX. The vendor also supports VAX VMS, and applications developed on any platform can be run on the others without reworking the source code.

My test platform was a SPARCstation IPC with 24 megabytes of memory. For single-user operations, dBase IV requires 4 megabytes of memory, but runs noticeably better with 8 megabytes. Ashton-Tate recommends that you add 1 megabyte for each additional



DBase IV for UNIX offers the components from the DOS RDBMS and provides the missing link for businesses committed to popular DOS applications.

user. The product itself consumes 6.5 megabytes of disk space.

A short set of instructions guided me through a half-hour installation process, including feeding in the four high-density floppy disks. Other media choices include tape and CD-ROM. The instructions were clear, but should be performed by a system administrator who knows details about device-names and network connections. Ashton-Tate has done a fine job of tailoring its installation procedures for Sun systems. The Sun installation is performed by Sun's standard `extract_unbundled` program. Ashton-Tate says its other UNIX products will take a similar track.

Many Features

SQL is a hot topic and Ashton-Tate made sure to provide an SQL interface. I was unhappy to discover that SQL commands can only be used on a database created using SQL. In other words, both SQL and dBase are included in dBase IV, but are only partially integrated. To Ashton-Tate's credit, many of the better dBase features can be accessed in SQL-mode. Ashton-Tate also belongs to the SQL Access Group, an industry group for standardizing SQL, so we might assume that future releases of dBase will have tighter integration of SQL commands.

In its 4GL arsenal, dBase IV has a screen painter, report generator, label maker, and a menu generator to tie it all together. Each of these pieces generates dBase programming language code that can be hand-tuned for specific applications. In addition, Ashton-Tate provides the source code for templates used to process objects created by the 4GL. The templates can be modified with a custom script language.

For programmers, dBase IV includes a full-featured text editor for modifying dBase code. If you are used to another text editor, you can open an editor window, but in a non-windowed environment it is handy to have the dBase text editor.

User Data Management

Experienced database manipulators can use dBase IV's control center to make ad hoc queries against their databases. In addition to application development facilities, dBase IV provides a comfortable center for user data management. A query-by-example (QBE) facility makes it easy to retrieve information using the same paradigm used so successfully in the mainframe world by Unisys' Mapper product, and in the DOS world by Borland's Paradox.

The dBase IV environment is easy to use because it is interpreted, like the Basic programming language. This means that commands are executed as you type them, giving immediate feedback about their effects. (dBase IV also has a compiled programming language, but we'll get to that later.) It's not necessary to write a long program, compile it, and then run it–only to discover that you made a mistake on the first line and have to start all over.

I liked being able to pop open the form designer and design a quick screen for data entry or retrieval, but because the form designer can only be used to design screens that can store data in one database at a time, complex screens must be developed by writing a program. I designed intricate reports by using the Quick Report feature of the report generator and then the cursor keys to move fields around the screen.

In order to see a combination of fields from different tables, I created a *view* in the query generator. Once created, I could use the view just like a normal table, generating screens (for retrieval only), reports, and queries.

Especially for Developers

Rapid prototyping is one key to satisfied clients. If you can shorten the application development cycle enough that you can afford to make several prototypes of your client's program, you can quickly converge on those requirements. 4GLs are the best tool you have in this effort.

In any 4GL environment–and that's what the dBase interactive environment is–the big question in a developer's mind is "How much hand-coding will I have to do?" No matter how good the 4GL code generator, there is always some portion of the application that must be hand-coded. Any subsequent changes made to a screen (or other generated object) will overwrite the hand-coding, so they will hopefully be kept to a minimum.

As part of the testing process for dBase IV I designed a standard invoice form, with the customer's name and address at the top and then a variable number of inventory items below. I was filled with trepidation when I discovered that such a common input form could not be created with the forms generator because it needed to write to more than one table. It was easy to write a program to display this invoice form, but as mentioned above, hand-coding at such an early stage of application development is usually bad news.

I was relieved to discover that even though I had modified the form generator output, the changes could still be processed through subsequent stages of application development. In particular, the Applications Designer was still able to link the modified code with other menu items. I commend Ashton-Tate for partitioning its 4GL so that modifications are localized.

The Applications Designer is where the program environment is set and the individual bits and pieces of the application are tied to menus. In addition, *templates* are used to create standard functions like browsing, re-indexing, and mailing label generation.

continued

REVIEW HIGHLIGHTS

dBase IV for UNIX
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90509-9972
213-329-8000

Sophisticated user interface, context-sensitive help, DOS compatibility, good support.

SQL poorly integrated into overall product, single-table restriction on form designer.

Version: *1.1*
Systems: *SunOS for Sun-4, SPARCstation, SPARCserver. SCO and Interactive support announced.*
Licensing: *Concurrent, enforced via license manager.*
Price: *$995/single-user, $2,995 for each four additional concurrent users. $395/single-user runtime, $995/four-user runtime. Documentation at $195/copy.*
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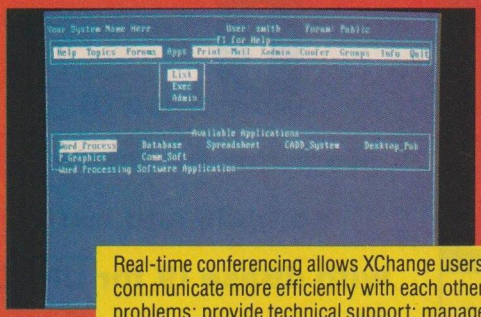
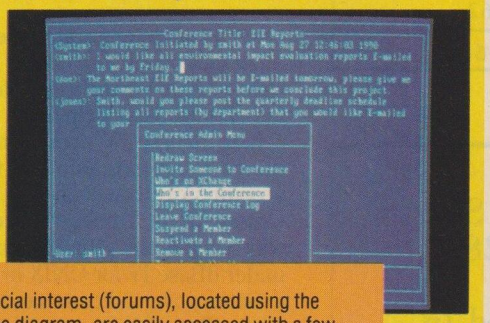
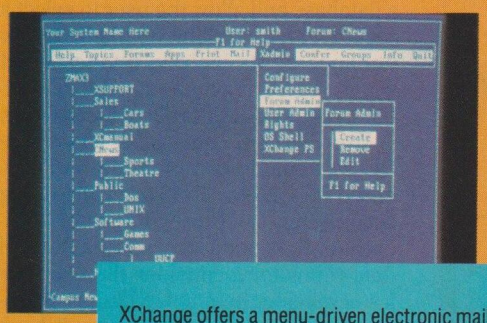


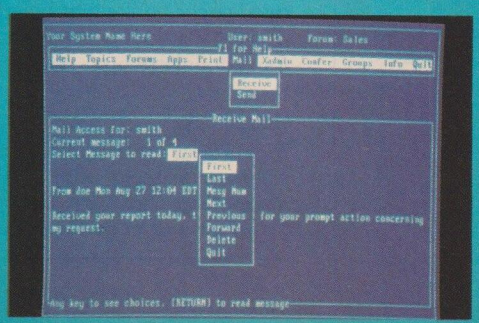
Real-time conferencing allows XChange users to communicate more efficiently with each other to solve problems; provide technical support; manage projects or discuss other subjects. A conference transcript can be saved for review by authorized users.



Areas of special interest (forums), located using the graphical tree diagram, are easily accessed with a few simple keystrokes.



XChange offers a menu-driven electronic mail facility which is compatible with the UNIX mail system.



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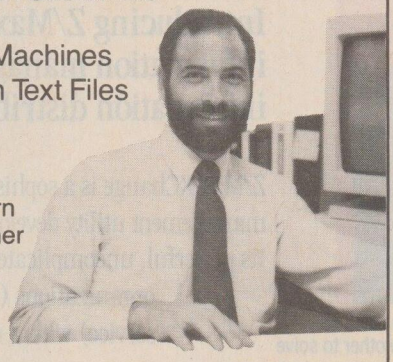

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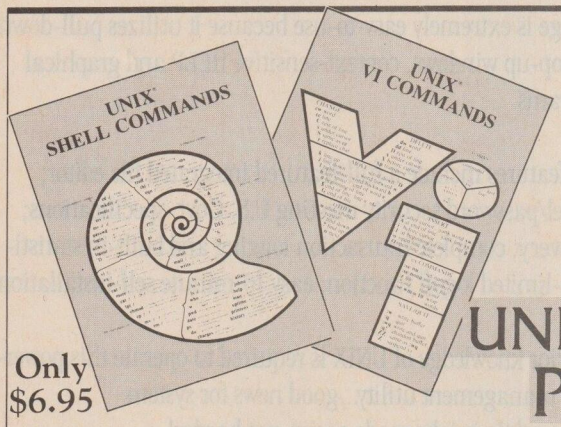

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Rick Farris is an independent software engineer working with firms in and around San Diego. He can be reached on the Internet as `rfarris@rfengr.com`.

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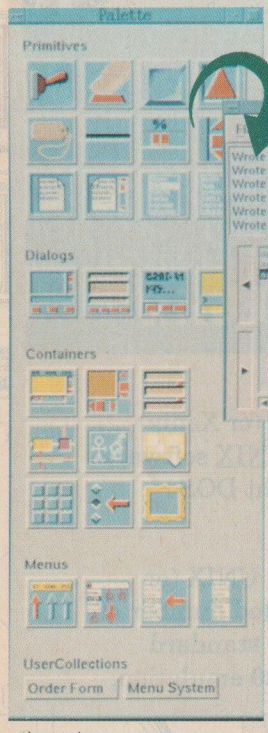

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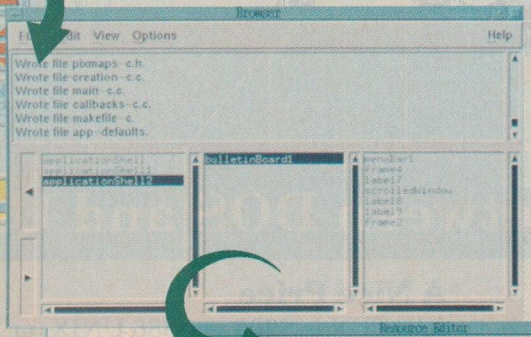

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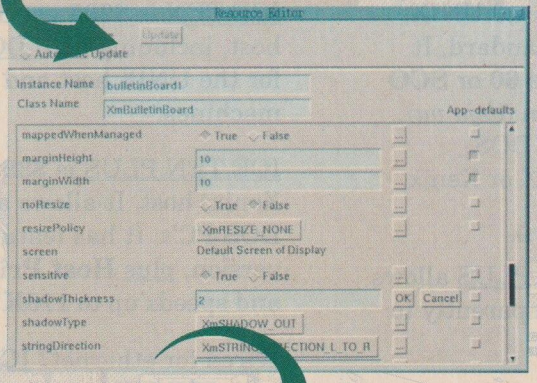

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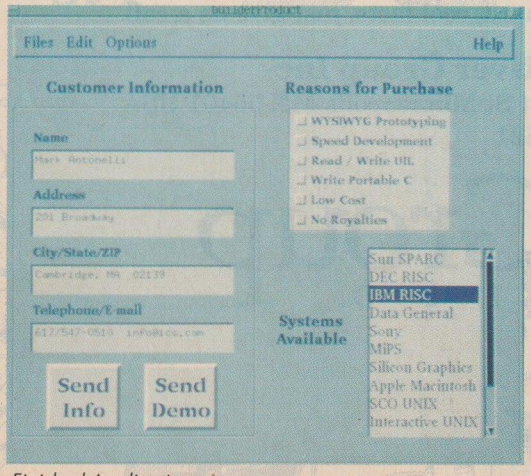

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AN ACCESSIBLE BULLETIN BOARD

By Mike Burgard

XChange from Z/Max makes UNIX easier for modem, network, and conference users

Sometimes, Z/Max Computer Solutions has a difficult time explaining its 10-month-old software product, Z/Max XChange. Usually, it is forced into using qualified negatives: it's not just a bulletin board system (BBS), and it's not just a menu shell that you access from a modem or network.

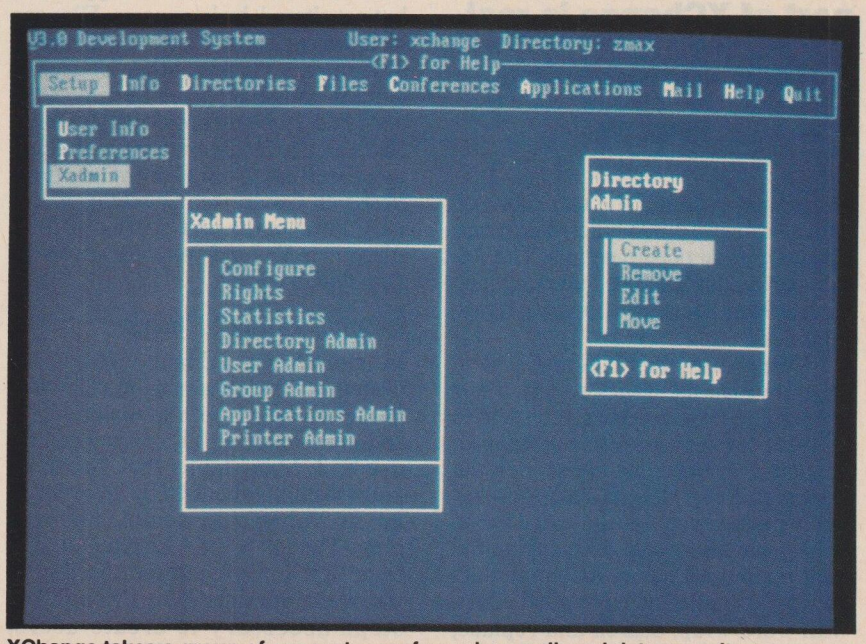
XChange is an advance in BBSing. The term currently in vogue to describe products like XChange is information management software (IMS), which is another way of saying groupware designed for conferencing. While XChange stops short of organizing group activities, it does provide systematic methods of exchanging information between sites.

A basic BBS lets a user log into a UNIX system, list directory contents, write letters to other users, and down and upload files. One of the best UNIX BBSs is MMB Development's TeamMate, slightly more expensive than XChange, but incorporating many of the same features. XChange transfers files using any emulation program, supports real-time conferencing, and uses pulldown menus. None of these features is supported by TeamMate.

XChange excels in its operating system shell, which lets you launch applications, run UNIX mail via a friendly interface, and participate in user conferences. At this level, XChange is more like menu shells such as Directory Shell, Menu Magic, and WordPerfect Office, although the conferencing aspect gives it the flavor of groupware.

Who would want to use XChange? Anyone who wants untrained users to interact with a UNIX system. Beyond this burgeoning category are more traditional UNIX users, especially those who exchange information with other departments and sites. Software companies could benefit by using XChange as the main interface to online support. System integrators and value-added resellers (VARs) should also take note of XChange, because it is a natural for organizing businesses.

You can log in to XChange from a modem, any network, or on a multiuser system running the host software. XChange provides a character-based windowing interface with pulldown menus and a graphical tree for XChange-specific directories, so you never have to use the UNIX prompt unless you want to. XChange supports most terminals, even ones with minimal cursor positioning like the VT100 and TVI955. After telling the operating system what type of emulation you are using, XChange handles all interface issues. The downside is that XChange does not give you a user-selectable way of specifying parameters, or options, for common UNIX utilities such as **find**, **grep**, or **diff**. But it does provide an easy-to-use pro-



XChange takes a group of concepts–conferencing, mail, and data repository–and wraps them into a tightly knit product with a pulldown menu system.

gram administration interface.

During installation on my Zeos 386 16-MHz SCO UNIX System V I machine ran into some minor permission problems that prevented XChange from loading. A call to the vendor fixed my errors and I was up and running in about 20 minutes. After that, the installation script was clear and easy to follow. XChange will run on SCO UNIX, Interactive 386/ix, AT&T 3B2, Sun SPARCstation, NCR Tower, and Data General Aviion. I tested XChange over a 2400-baud phone line from a PC, and from a multiuser terminal and the console.

Calling Home

XChange supports any type of terminal or emulation software that provides full-screen mapping. In most cases, users logging into a host system bypass the UNIX log-in sequence and go directly into XChange, which has its own log-in and password prompts. The net result is that XChange is there to hold the user's hand from the start.

Z/Max made tactful use of color and inverse video in XChange. When the software starts up, a menu list appears across the top of the screen. You can access the main menu options (Help, Directories, Files, Print, Mail, Admin, Confer, Info, and Quit) by moving the cursor and pressing the enter key, or with a keyboard mnemonic. Main menu options lead to pop-up menus. The Admin pop-up, for instance, offers options such as Preferences and Operating System Shell.

A big part of XChange is real-time conferencing

XChange uses the UNIX mail system to route mail messages to any other user on the system. Mail can be sent to any user or to a group of users. A pop-up window provides a list of users on the system and, like all of XChange's selection windows, you use the space bar to mark your selections. After typing the mail recipient's name, XChange puts you into its native editor–a good effort, with word wrap, search and replace, and other features. If you want, you can have XChange work with your own editor, but no matter which editor you use, mail is routed the instant you save it to a file. Mail can also be sent via UUCP by selecting the "Other" command. If you are dialing in on the system's only modem, XChange sends the mail as soon as you log off.

A big part of XChange is real-time conferencing. A conference can have any number of users. A good example might be a large business with multiple sites because conferences might be initiated between two or three sites. Users who join a conference late can quickly scroll through previous notes and then join the conference. Computer conferencing, as opposed to a 5- to 10-person phone conference, is not as fast-paced, but it is much easier to follow individual participants, especially when the number of participants jumps to 20 or 30. XChange also lets you record conferences and turn them into topic files for later reference.

Information stored on the UNIX host is accessible through XChange directories, which equate to UNIX subdirectories. Typically, topic files are arranged by subject, so you can take advantage of XChange's graphic tree display to peruse different topics. You navigate the tree with the cursor keys, moving the inverse video highlight from directory to directory, until you find the subject you want. Then you press the Enter key and XChange displays the topic file that you selected.

Any user or group of users can be given permissions to create, edit, or delete files. Files that result from conferences can be accessed and appended, but not altered, by later users. Files can be down or uploaded from the XChange system on a PC or another UNIX system. XChange supports Kermit, Xmodem, and Ymodem protocols. Z/Max is also slated to incorporate the native protocol in Blast from Communications Research Group (see *UNIXWORLD*, January 1990) in the first quarter of 1991. All options files and protocols are on the Directories pop-up.

Administrating XChange

In many ways, XChange makes the system administrator's job relatively straightforward–both in maintenance and in the manner it helps you control users. Z/Max claims that you need know nothing about UNIX in order to get an XChange system up and running. Though a little far-fetched, it is true that once installed, XChange walks the administrator through the steps necessary to create users, change passwords, build forums, and generally set-up XChange. The Admin submenus contain the options for system administration.

From the Admin User command, the system administrator provides each user with default permissions. Users can be listed, added or removed, and their status checked. You also can administer XChange directories from within the Admin menus by adding, editing, or removing directories from the system. Removing a directory also removes all topic files residing in the directory. Because of their importance, XChange warns you before you delete topic files.

Making administration even easier is the Groups command. Because conferences and topic access often involve groups of users, groups with similar access rights and permissions can be created. Controlling XChange and maintaining security is made easy by dealing with groups rather than individual users.

REVIEW HIGHLIGHTS

Z/Max XChange
Z/Max Computer Solutions, Inc.
P.O. Box 339
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Strong conferencing system. Excellent interface for remote access. Easy-to-maneuver menus. Reasonable security features.

No hooks to system administration tools. Slow screen redraws. Compromised graphics in order to broaden appeal.

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An XChange administrator controls access to topic files by denying read or write permission to any user or group of users. For example, if there is a topic file directly related to technical support, only registered support users receive access permission. In addition, the topic file can be hidden from view so that other users need not know it exists. XChange supports print through the Print option, which makes use of the system spooler. XChange uses the standard Terminfo database.

Help is available for every menu command

The applications interface is a pop-up window with a list of applications loaded by the system administrator and accessed by moving to the desired application and pressing Enter. XChange allows enough room for a 35-character description of each application, but does not check to see if the system administrator correctly named an existing application—a small oversight, but one that sticks out like a sore thumb in the otherwise easy-to-use administration routines.

Documentation comes in the form of a small, comb-bound manual designed for the administrator. The information is logically presented by menu options. Z/Max claims that users need no manual because of the context-sensitive help. Phooey. There are always enough readers among us who enjoy turning pages. Z/Max suggests that administrators print out XChange guidelines sheets for users who demand hard copy.

Help is available for every menu and command. The main Help command drives a hyperbased full-screen help system. Unusual on a UNIX application, XChange's help system lacks depth (all the more reason for user documentation), but is easily accessible and understandable. It serves as a good model for other programs.

An Interface Compromise

The interface itself is a cross between state-of-the-art and down-home UNIX. Pulldown menus, first-key recognition, and pop-up lists make XChange a breeze to use. But the menus avoid

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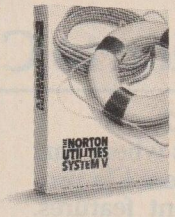

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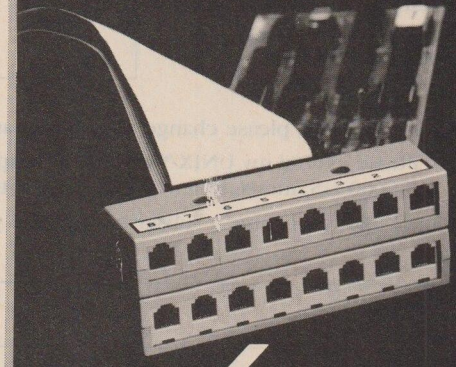

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strong use of color, shadows, or other background aesthetic techniques. According to Z/Max, this was intentional–a tactic to avoid onerous screen redraws for users who access the system using a 2400-baud modem while still providing a friendly, full-screen interface.

XChange's real goal is to make access to a UNIX-based system child's play for a computer neophyte. For remote access, XChange comes as close as might any program designed for the character-based world. With no cryptic commands to memorize, an XChange user can be successful by using F1, ESC, cursor keys, and Enter to navigate the entire system. Common key conventions are retained with all special keys. Using the first letter of any menu item makes selections even easier for the casual user.

Networks will find XChange flexible and useful

Support is available in both BBS and voice form at no additional charge. Potential buyers can dial up an on-line version of XChange to evaluate the system. In most cases you won't require support, although you may have to call if you are having problems running XChange in a X window. Z/Max reports some trouble in this area–you must run XChange in an 80-column window–but adds that it is working on a port for the X Window System. Additionally, it is developing a XChange front end for Microsoft Windows.

XChange takes a group of concepts–conferencing, mail, and data repository–and wraps them into a tightly knit product with a pulldown menu system. Networks and remote access users will find XChange flexible and useful. Standard BBS applications, as well as universities and multiple-site corporations, will like XChange's security system, unlimited conferencing, and convenient access to topic files. ■

Editor-at-Large Michael Burgard is a regular reviewer for UNIXWORLD and a data systems information manager for a commercial printing company in Montana.

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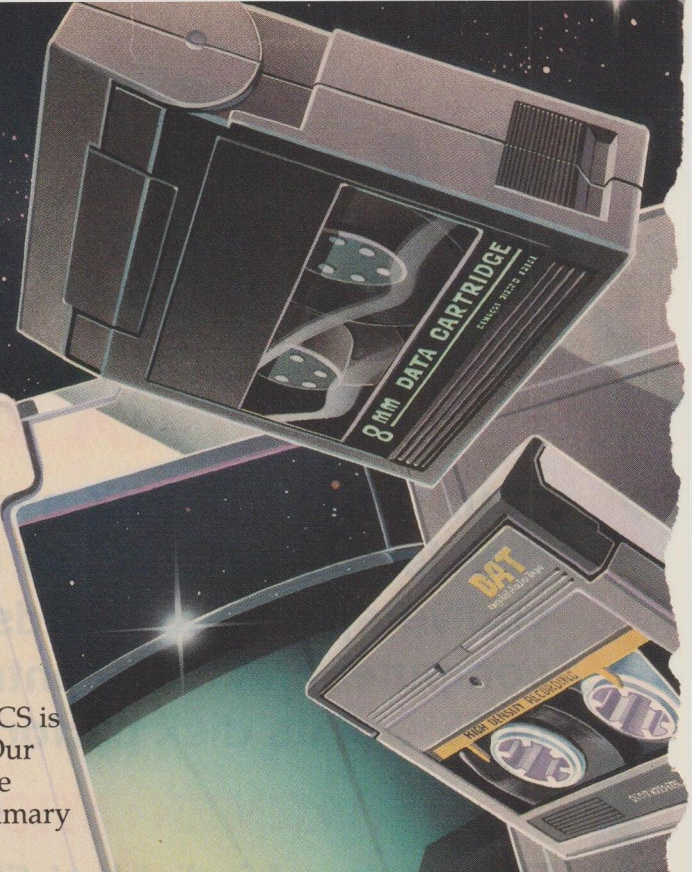

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Update by Frank Hayes

THE TANGLED WEB OF U.S. GOVERNMENT STANDARDIZATION

Like almost everything else, governments need standards. In fact, in many countries the officially designated national standards organization is a government bureau. That's not the case in the United States. ANSI (American National Standards Institute) is a private organization, and the U.S. government isn't officially represented in international standards activities.

Government agencies also create standards on their own. And when the U.S. government–which happens to be the world's largest single customer for computer equipment–unilaterally creates standards for computers, they are bound to have an impact on users and vendors throughout the world. In fact, government standards decisions sometimes have more impact on vendors than official international standards do.

Why do government agencies jump the gun instead of waiting for international standards? One reason is that the U.S. government must purchase its computers by specification, not by brand name. That means standardized specs are essential for making large-scale purchases from multiple computer vendors. The no-brand-name requirement is designed to short-circuit favoritism by government buyers. When a government agency buys billions of dollars worth of computers, the specification is an instant standard for vendors who want a piece of the contract.

Sometimes government departments just can't wait for the official international standards that are on the way. Sometimes there are no proposed standards that meet government needs. And sometimes government agencies have ulterior motives in attempting to control standards, especially in areas such as data and system security. Of course, no law forces vendors to conform to such government "standards"–but the hope of selling to the world's biggest computer customer is all the encouragement most vendors need.

NIST: Jumping the Gun?

The National Institute for Standards and Technology (NIST) is the federal agency most directly responsible for standards work. NIST is not the U.S.'s officially designated national standards organization–that's the job of ANSI. But NIST does specify standards for a wide range of government-related items, including computer systems that the U.S. government purchases.

A computer standard from NIST is called a FIPS, or Federal Information Processing Standard. Not every computer the government purchases has to conform to a FIPS. However, FIPS conformance simplifies the process of buying equipment–it puts a product on the "approved" list. As a result, conforming to a FIPS makes buying equipment easier for government agencies and selling easier for vendors.

What happens when the standards the government needs don't exist?

Creating a FIPS requires publishing drafts and requesting comments just like national and international standards, as well as a journey through the government bureaucracy. In fact, once NIST has completed work on a FIPS, it still takes about nine months to work its way through the U.S. Department of Commerce for final approval. Because of the time–and pressure from government agencies wanting FIPS–NIST sometimes adopts draft versions of international standards, rather than waiting for completed standards to be signed, sealed, and delivered.

The adoption of international drafts by NIST is currently causing controversy over the FIPS for Posix. Posix is an emerging international standard for UNIX-like open systems. A key part of Posix is the standard for the Posix shell and utilities, currently being developed by the IEEE 1003.2 committee. NIST wants to issue a FIPS based on the 1003.2 committee's Draft 9. Unfortunately, the IEEE standard is likely to change significantly from Draft 9 before it becomes official. Should NIST use Draft 9 now, and later amend the FIPS? That seems like a bad idea to many of the vendors who will have to meet the FIPS specifications when selling computers to the government.

Why can't NIST wait for a final Posix draft? Mostly because the U.S. government itself won't wait–federal agencies will buy $20 billion or more of Posix-compliant computers before the Posix standard is complete at the international level. NIST must help specify those computers, and the agency argues that any standard is better than no standard at all. NIST staffers also hope that its early FIPS will help push the official Posix shell standard to a quick completion.

CIA Meets CD-ROM

What happens when the standards the government needs don't exist? That problem is well illustrated by the current situation with CD-ROMs. CD-ROMs are optical compact disks, physically identical to music CDs, but containing computer data. CD-ROMs are "read only," so they can't replace conventional storage devices such as hard disks, tape, or drives.

CD-ROMs are inexpensive to mass produce (a few dollars each) and the drives to read them are reasonably priced (in the $500 range). Each disk

can also hold as much as 500 megabytes of data, which makes CD-ROMs perfect for distributing identical copies of large databases to many different government users.

There's even a widely used international standard for CD-ROMs–the ISO 9660 standard, sometimes called the "High Sierra" format. ISO 9660 makes it possible for almost all CD-ROM disks to be exchanged between systems. However, the standard only specifies the physical format and file and directory storage for CD-ROMs. It doesn't cover indexing and formatting of databases, which is a problem for several reasons. CD-ROMs can hold large amounts of data that can't be changed, so it makes good sense to index the data in advance. And compared to magnetic disks, CD-ROM drives are relatively slow. Conducting your own search and indexing on a half-gigabyte of optical data wastes lots of time. But without standardized CD-ROM database indexes, every indexing scheme is different and requires its own specialized software.

Unfortunately, there's not even a de facto standard for CD-ROM database indexes, and none seems likely to appear soon. To fill that gap, the U.S. Central Intelligence Agency announced last fall that it had developed its own CD-ROM database standard. The standard, dubbed CD-RDx, is intended to work on all operating systems, including UNIX, PC-DOS, the Macintosh, and OS/2.

The good news is that the CIA, along with the Defense Intelligence Agency, the National Security Agency, and other U.S. government bureaus, announced it would make its proposed standard widely available for review and comment. In fact, the intelligence agencies even sponsored a two-day workshop on CD-RDx at last year's CD-ROM Expo in Boston.

The bad news is that the CIA is still the CIA. The agency may have entered the standards arena, but its basic business is still cloaks and daggers. Unlike conventional standards organizations, the CIA keeps tight controls on all information associated with the agency, including the proposed CD-ROM standard. Though the agency says it hopes to make CD-RDx widely used in both government and industry, the draft standard is available only by written request. The CIA also won't comment on almost anything associated with the process–certainly an unfamiliar situation for those who have seen the highly public hashing-out of most international standards.

(Copies of the proposed CD-RDx standard *are* available–by written request only–from the Information Handling Committee, Intelligence Community Staff, P.O. Box 90828, Washington, DC 20090-0828. However, a CIA staffer would not confirm whether copies of the standard would be available to anyone who inquired, or whether availability was limited only to U.S. residents or companies interested in producing CD-ROMs for the U.S. government.)

NSA: Security Blanket

Do government agencies ever manipulate standards for their own purposes? One agency that has been the focus of such complaints is the National Security Agency, or NSA. The NSA's primary job is breaking coded messages from foreign governments, and it usually keeps a low profile–although it experienced an unaccustomed burst of publicity in 1989 and 1990 when Robert Morris, the son of an NSA chief scientist, went on trial for launching the "Internet worm" that shut down the government-sponsored Internet network in 1988.

Governments seem likely to become more entangled in standards processes

As you'd expect, the NSA's low profile also extends to standards activities. However, the NSA has had a significant impact on at least two widely used computer-related standards. In the early 1980s, the National Bureau of Standards (the forerunner to today's NIST) was considering proposals for its Data Encryption Standard (DES). A major question was how many bits to use for DES code keys. More bits would slow the encryption and decryption process slightly, but would make encoded messages much more difficult to crack. Many users urged NBS to specify the most secure DES possible.

In the end, under pressure from the NSA, NBS adopted a weaker standard, using a relatively small number of bits. True, the final DES standard was reasonably secure from most code-breaking techniques, but the NSA made sure the final standard would produce codes that wouldn't stand up to their own supercomputers. Encryption hardware based on the relatively weak DES specification is widely used in the U.S. today for encrypting financial and business information.

More recently, the NSA developed its "Trusted Computer System Evaluation Criteria," unofficially known as the "Orange Book" standards. The NSA developed the standards for the Defense Department, and the agency certainly didn't water them down. In fact, no existing computer systems are known to conform to the highest levels of Orange Book standards. The NSA is pressing for Orange Book standards adoption for computer security outside the Defense Department, too. Some critics complain, however, that while the Orange Book criteria fit well with existing military security classifications, they don't meet the needs of most business and government users.

There's another catch to widened use of Orange Book standards. Currently, certifying that a computer system meets Orange Book standards is a lengthy process often taking a year or more. Certification appears to require detailed testing and inspection of all aspects of a computer system, including the source code of the operating system. No one is completely sure what is involved, because the only agency that certifies Orange Book compliance is the NSA, which does so in secrecy and refuses to comment on the process. Whether the NSA is just testing for security conformance–or is actually looking for security holes that the NSA or other government agencies could later exploit–is impossible to say.

With or without ulterior motives, government standards for computers are not going away. Governments seem likely to become more and more entangled in official and de facto standards processes in the years to come. In some cases, such as Posix, the result is strong support for quick completion of an international standard. In other cases, like DES and Orange Book security, there may be more to government standards involvement than meets the eye. In still other cases, such as the CIA's CD-ROM database proposal, it may take some adjustment on the part of both the government agency and potential users to create the dialogue required for real and useful standards. ■

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CIRCLE NO. 177 ON INQUIRY CARD

X DISPLAY MANAGEMENT

Part I: How to make your new networked X terminals as easy to start as the old direct-connected ASCII ones

by Mike Braca

Mike Braca is vice president of advanced marketing and technology at Visual Technology Inc., a manufacturer of X terminals. Braca is a member of the team that delivered the world's first X terminal, the Visual V640, in August 1988.

You got rid of that old ASCII terminal on your desk and replaced it with a shiny, new, state-of-the-art X terminal. You plugged it into the network and powered it on. What did you get instead of the familiar "Login:" prompt? A distinctively stippled gray screen. Why? You need a display manager.

In the X Window System world, the term "display management" refers to the process of starting and terminating user "sessions" at a workstation or other display device, such as an X terminal, running an X server. Loosely defined, a "session" is a period of time that starts when the user fires up the first X client application from the X station and ends when all X client connections to that display are closed. The primary role of a display manager program is to enable X display users to easily start and end sessions.

In part one of this two-part series we first discuss the need for display management and its system access interface. Then we describe a typical connection scenario in terms of the X display management control protocol (XDMCP). We wind up this installment with a look at secure access control.

Connecting the Hard Way

On an alphanumeric terminal, connected by serial line directly to a host computer, a session is well delineated by the log-in and log-out actions. The session begins with an authorization process. The user typically enters an account name and password, then control is turned over to a command interpreter, for example a UNIX shell. Logging out of the session is achieved by exiting from the shell, at which point the log-in prompt re-appears and the terminal is ready for the next user.

By contrast, on an X terminal the display management process is often done manually. After powering on the unit, the user will typically have to employ a local terminal emulation process that can use a standard network terminal access protocol, such as Telnet in the TCP/IP protocol family or DECnet's Cterm, to open a connection and log into a host. From that "dumb terminal" session, the first X client, typically a terminal emulator (`xterm`), can be started on that particular host.

When the Telnet or Cterm session is closed, the `xterm` window appears on the X terminal. To end the X session, there is often a local function on the X terminal to close all current X client connections. The more expedient approach of simply turning off the X terminal is generally frowned upon, because with many host implementations of the TCP/IP networking protocols, the X clients are not notified that the other end has disappeared unless the connection is explicitly closed, and therefore the clients hang around interminably.

A major goal of providing a display manager program is to integrate the X terminal completely into a networked environment by effectively emulating the simplicity of the serial-line-terminal session control. As base-level functionality, when an X terminal is powered on it should be possible to have a "log-in window" appear automatically.

Once you log in, an automatic initialization procedure should run to bring up applications and position their windows as specified in your personal session "profile" script. After you log out of the X session, all connections should be closed, the terminal should be reset to a known state, and a new

log-in window should appear, ready for the next user. This scenario can be achieved by having the X terminal communicate with a display manager program between user sessions.

Like a Getty

The first version of the X Display Manager (`xdm`) appeared in Release 3 of Version 11 (X.V11R3, see sidebar) and was intended primarily as a substitute for the UNIX system `init-getty-login-shell` user-session process sequence to control a local workstation display. The workstation environment can be configured so that at system boot time `xdm` gets control, starts the X server, and displays a log-in window. At the end of each user session, `xdm` regains control, starts a fresh copy of the X server, and again displays the log-in window. In X Version 11 Release 4 (X11R4), the `xdm` implementation included support for XDMCP, thereby providing the same work session control convenience for remote displays, mainly X terminals.

In a networked environment, you may crave more advanced functionality. Extending the character terminal analogy a bit, at many sites the terminals are physically connected to a terminal server that is itself connected to an Ethernet. An initial conversation with the terminal server will result in a network connection to the desired host. Many terminal servers also permit multiple host sessions to be active simultaneously for a single terminal, with "hot-key" switching between sessions. Similarly it should be possible (on an X terminal) for you to see which hosts on the network have display managers running, and select one or more of them with which to connect. You should expect to see expanded support for this type of connectability in a future `xdm` release.

X Display Manager Protocol Operation

Figure 1 shows the sequence of events leading to a successful X session launch on an X terminal through XDMCP-controlled interaction with the `xdm` display manager program on the host system. This procedure may appear to have more steps than seem necessary, but this so-called "three-way handshake" is needed to earn the "Good Networking Seal of Approval."

Query. After power on, the appropriately configured X terminal calls out to one or more `xdm` display managers on the network. In the TCP/IP protocol world, requests are sent to the well-known port assigned to XDMCP, UDP port 117. The XDMCP protocol provides three ways for an X terminal to initiate contact with a display manager. Figure 1 shows the terminal sending directed "Query" packets to three hosts—A, B, and C. Presumably the list of hosts to contact in this case is configured into the X terminal.

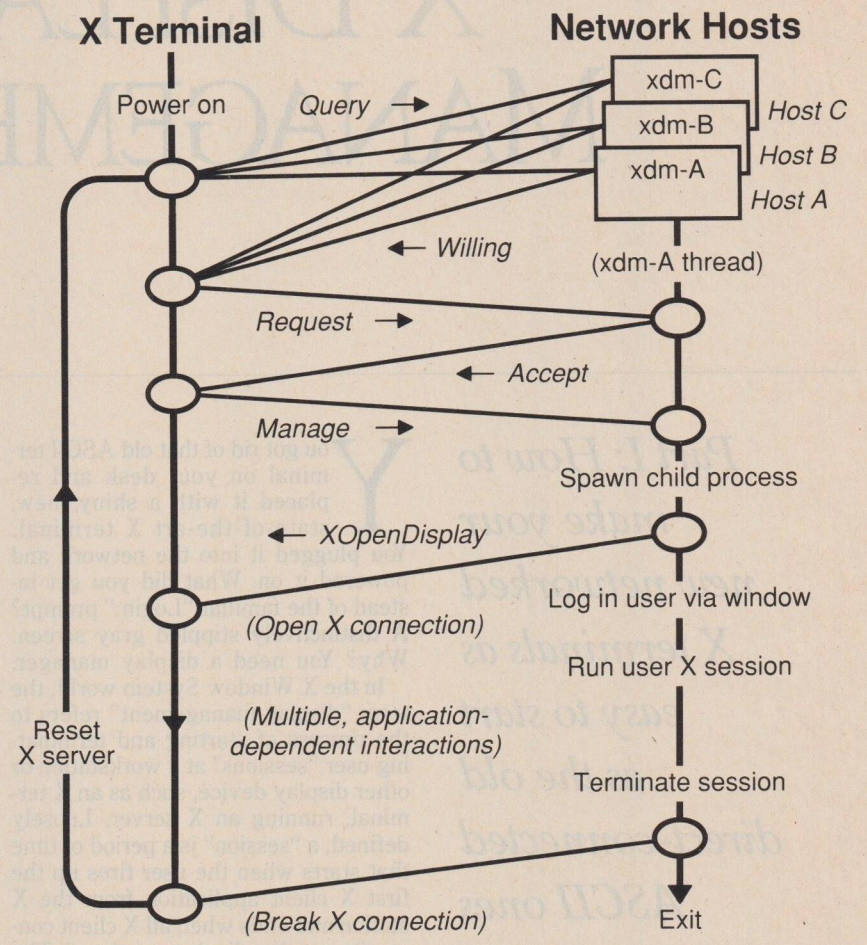
Two other types of query requests are available: *broadcast query*, which is used when configuring a list of hosts is less desirable than simply blasting the request to the entire network, and *indirect query*, which is used to ask a host to relay the query to a second set of hosts.

Willing. Legal responses by a display manager to a directed Query request are Willing or Unwilling packets, depending on whether or not the display manager is interested in pursuing the conversation. Figure 1 shows all three `xdm`s contacted returning the Willing response. An Unwilling response might be returned if, for example, the particular X terminal is not currently authorized to connect to that particular host. Unwilling hosts that receive a Broadcast or an Indirect Query do not respond at all.

Request. Through some procedure, often arbitrary, on the X terminal, one of the `xdm`s is selected to manage the X terminal display. The X terminal sends a Request packet to the selected `xdm`, in our example the one running on Host A, to continue the mating process. The goal of the Request packet is to obtain a unique session ID from the display manager to distinguish this session from one on this X terminal that may not have terminated cleanly.

Accept. At this point the `xdm` program decides if it really wants to service this particular X terminal. Legal responses here from the display manager are Accept or Decline packets. A

FIGURE 1: A typical dialogue between an X terminal and an `xdm` X display manager. There are two phases to the interaction: the initial XDMCP-controlled negotiation phase, followed by the X session itself.



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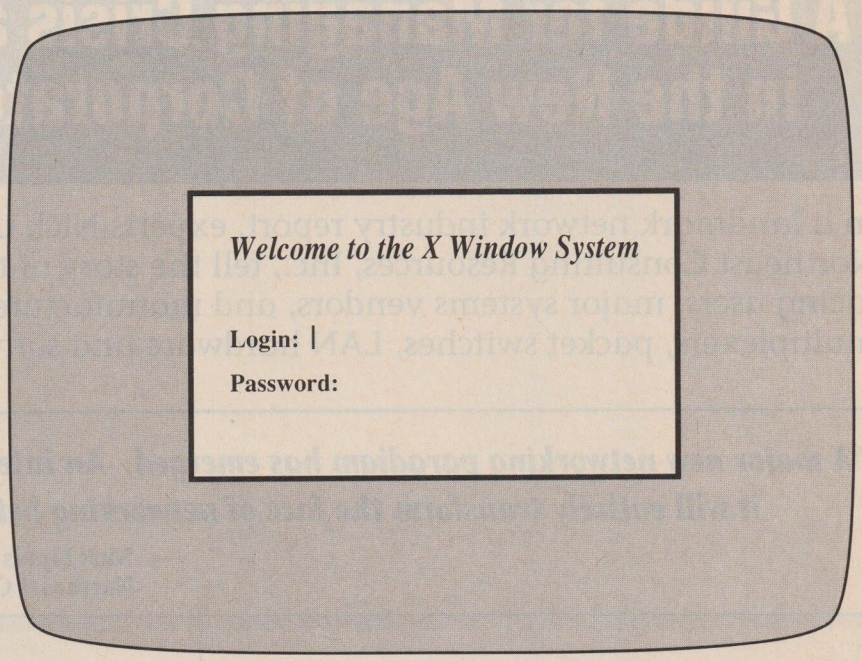
possible reason for declining the X terminal's advances is if, for example, the host running the `xdm` process is currently managing its quota of displays. Figure 1 shows the `xdm` on Host A accepting the request by the X terminal. The display manager sends the unique session ID to the X terminal at this point.

Manage. Things are getting serious now, and the X terminal, by sending a Manage request, proposes to have the `xdm` manage the terminal's display. The terminal passes the session ID it received in the Accept packet.

Initiate Session. Now committed to managing the display, the `xdm` will switch to the X protocol and attempt to open a normal X connection to the terminal. The display manager does not send any further XDMCP packets if the X connection is successfully initiated. However, if the session ID does not match the one generated in the Accept packet, a Refuse response is sent instead. If the display manager tries, but cannot open an X connection to the terminal, a Failed packet is transmitted.

Typically, before attempting to open

FIGURE 2: The default `xdm` log-in window. Fonts, colors, and the wording of the greeting message are all configurable per host and per display managed.



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the X connection to the terminal, the display manager will have spawned a child process dedicated to managing the X terminal. The lifetime of the X connection established by this child process defines the user session, and that, in fact, is the connection's only purpose. (However, `xdm` may be configured to call `Xsync()` to "ping" the terminal occasionally, verifying that the connection is still alive.)

Normally only after the last X connection to a server on an X terminal is closed does the X server reset in preparation for the next user session. However, because the termination of a user session is indicated by the display manager closing its initial X connection, at that point the terminal should break connections to all clients that were launched during the session. XDMCP also defines a method for terminals to check for a hung work session by sending Keepalive requests to the `xdm` port. If `xdm` does not respond with an Alive packet in a reasonable amount of time, the terminal can take some unspecified action, possibly even aborting the session.

continued

X Display Management Evolution

The need for the display management function was recognized quickly after X terminals were introduced in 1988. At Visual Technology, our first effort was dubbed the "X login daemon," `xlogind`, and it operated simply by listening on a well-known network port for an "X log-in request," then starting up an `xterm` application running a log-in shell (an `xterm` option that was discarded in X.V11R4).

A list of hosts was configured into the X terminal, and at power-up and any time the last X client connection was closed the terminal would cycle through the list sending X log-in requests until a host responded.

Meanwhile the development folks at the MIT X Consortium saw the need for providing the display management function to manage the local display on a workstation. The `xdm` display manager program first appeared in the X.V11R3 release and made it possible to set up workstations so that during bootstrap `xdm` gets control, starts up the X server, and puts up a log-in window. After the user successfully logs in, control is passed to a user-specified "session manager," usually by default an `xterm` X client or a window manager, from which the user can launch applications and, at the end of the session, effectively log out by terminating the session manager process. When the session manager returns control to the display manager, the X server is reset and a new log-in window is displayed.

The `xdm` display manager can also be set up to manage a remote X display across a network—for example, an X terminal. However, when run in this mode, the X.V11R3 version of `xdm` could only poll remote X servers that were listed in a configuration file, which is less convenient and flexible than having the X terminals themselves initiate the management service requests.

To solve these deficiencies, an MIT X Consortium effort led by Keith Packard was organized to architect and develop such a flexible display management initiation scheme. The resulting X Display Manager Control Protocol (XDMCP) was approved as an MIT X Consortium standard, and a sample `xdm` and X Server implementation appeared in the X.V11R4 release.

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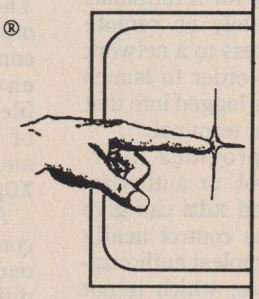

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There is nothing preventing an X terminal user from simultaneously starting up multiple sessions from a single terminal (although the X terminal itself has to provide the capability to do so). In that case, the terminal will try to keep track of which incoming X connections belong to which session, so they can be cleaned up when the corresponding display manager closes its own connection. In general, this is only possible if an authorization mechanism is being used (see Display Access Control, below). If there is more than one session and the terminal cannot determine which clients belong to which session, the client connections will be closed and the X server reset only when the last display manager connection is closed.

Once `xdm` is committed to running a user session and the X connection is open to the X terminal server, the following events occur:

- Using the standard `xrdb` X client, `xdm` downloads a resource database. The resources mainly configure the authentication widget, which is used in the log-in window.

- Then `xdm` identifies and authenticates the user via a log-in window, as shown in Figure 2.

- Following a successful log-in procedure, `xdm` will run three programs in sequence: startup, session, and reset.

The startup and reset programs are run with superuser privilege and are intended mainly to perform housekeeping duties for a local display log-in procedure. They can be left unconfigured if the user is only controlling X terminals. The session management program, which is run with the user's privileges, is normally a script that will try to locate and run the user's own session management script (typically a file named `.xsession` in the user's home directory). If the user's session script does not exist, a default session consisting of a window manager and an `xterm` client is usually invoked.

Like the UNIX system `login` program, `xdm` will set the usual environment variables (such as `HOME`, `USER`, `PATH`, and `SHELL`) for the current log-in session. Additionally, it will set the `DISPLAY` variable to the name of associated X terminal display. (This variable names the default device where output from X clients will be displayed during the session.)

If the X terminal does not support XDMCP, it is still possible to have the `xdm` program manage the display. However, in this case, the `xdm` has to be configured to poll the terminal periodically to notice when it is powered on or between sessions and ready to be managed.

Display Access Control

You may be familiar with the `xhost` scheme for preventing unauthorized people on the network from sending random X requests (for example, remapping your keyboard) to a workstation or X terminal. You may also realize that this is not a very effective mechanism, especially for X terminals that depend exclusively on remote clients, because if access to a network host is opened up in order to launch clients from it, anyone logged into that host has access to your terminal.

The X protocol provides finer-grained access control, or authorization, and XDMCP and `xdm` can give the benefits of access control nearly transparently. The simplest authorization protocol available, which is not very secure by networking standards, but does about 90 percent of what you want an authorization mechanism to do, is named MIT-MAGIC-COOKIE-1. Here's how it works with an X terminal that supports the protocol:

- During the XDMCP handshake procedure, the selection of MIT-MAGIC-COOKIE-1 as the authorization protocol is negotiated between the display manager and the X terminal.

- While accepting the connection, `xdm` generates a "magic cookie" (essentially a hard-to-predict random number) and passes it to the terminal.

- The terminal will now reject any connections unless the initial X client information for the connection indicates the MIT-MAGIC-COOKIE-1 protocol and contains a current magic cookie.

- After the X terminal user has logged in, `xdm` will put the display name and magic cookie in a file called `.Xauthority` in the user's home directory. Any X client linked with the X.V11R4 Xlib routines will be able to open the display because the `XOpenDisplay()` routine knows to go get the magic cookie from the file and show it to the terminal.

- Only magic cookies from current sessions are valid.

The X terminal access control problem is now reduced to the level of security provided by the host file system. The user is free to allow access to other users by letting them read or copy the file. If the `XAUTHORITY` environment variable is set to a file name, it overrides the selection of `$HOME/.Xauthority` as the source of the magic cookie for `XOpenDisplay()`.

A single `.Xauthority` file may contain several magic cookies, each one corresponding to a session on a different display. Use the standard X client `xauth` to peruse and even edit your `.Xauthority` file.

Note that you must make sure no hosts are allowed access to the X terminal via the `xhost` mechanism, because that permission overrides the magic cookie authorization. On the other hand, to run pre-X.V11R4 clients, `xhost` access must be allowed for that host. X terminals vary in the mechanism used to control host access; some use a local configuration option and some allow a remote `xhost` to change the access lists.

This month the X Display Manager Control Protocol has been discussed and it has been demonstrated how it establishes an X work session with an X terminal or a workstation. Next month, the finer points of configuring the X Display Manager for setting up and administering an X work session will be discussed. ■

Additional Reading

- Packard, Keith. *X Display Manager Control Protocol*, MIT X Consortium Standard, Version 1.0 (at `${TOP}/doc/XDMCP` in the X.V11R4 distribution source tree).
- Scheifler, Robert and James Gettys. *X Window System. 2d ed.*, DEC Press, 1990. A superset of the X11R4 MIT documentation; covers the X protocol, including XDMCP.
- Scheifler, Robert W. Edited and with an Introduction by Adrian Nye. *Volume 0: X Protocol Reference Manual* in "The X Window System Series" from O'Reilly and Associates. Sebastopol, Calif., 1989. Programmer's reference to the X.V11R3 network protocol.
- The `xdm`, `xrdb`, `xauth`, and `xhost` manual pages.

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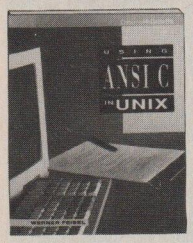

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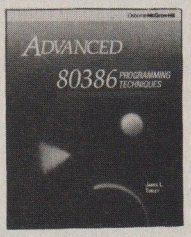

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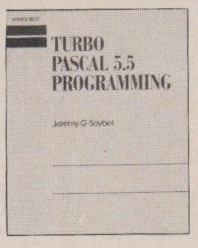

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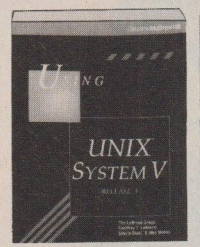

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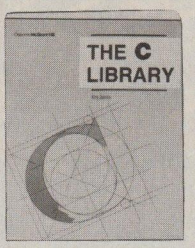

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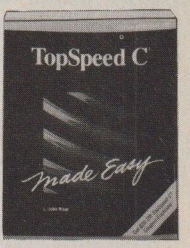

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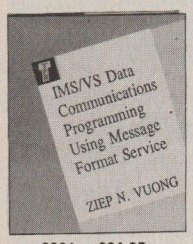

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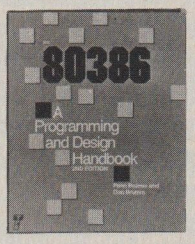

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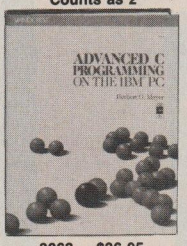

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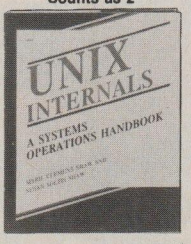

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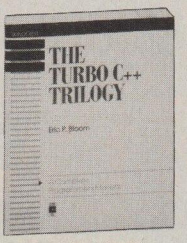

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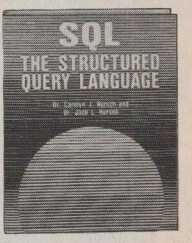

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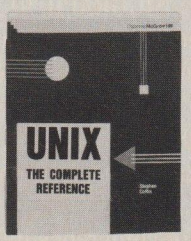

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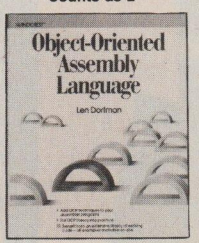

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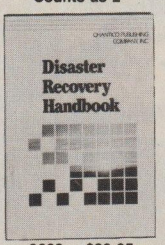

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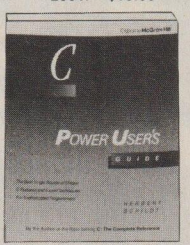

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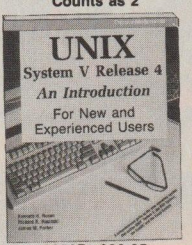

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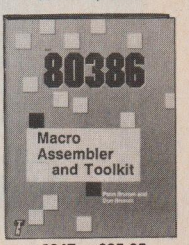

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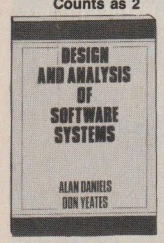

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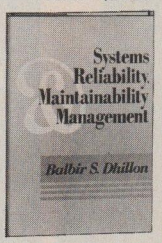

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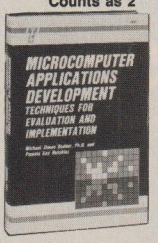

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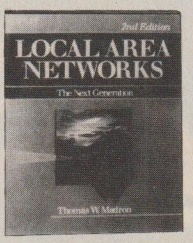

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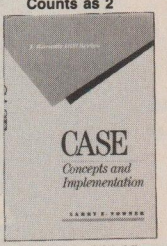

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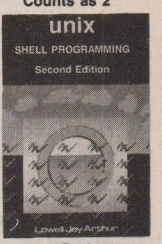

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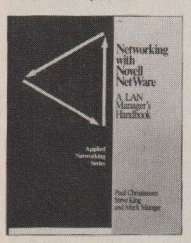

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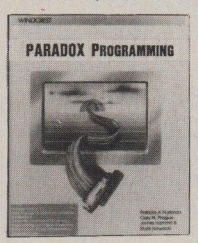

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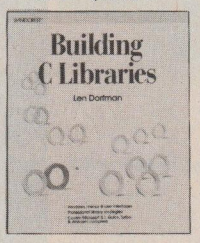

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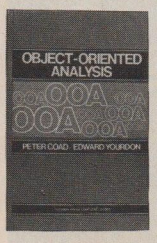

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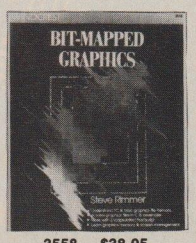

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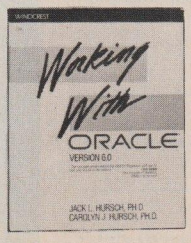

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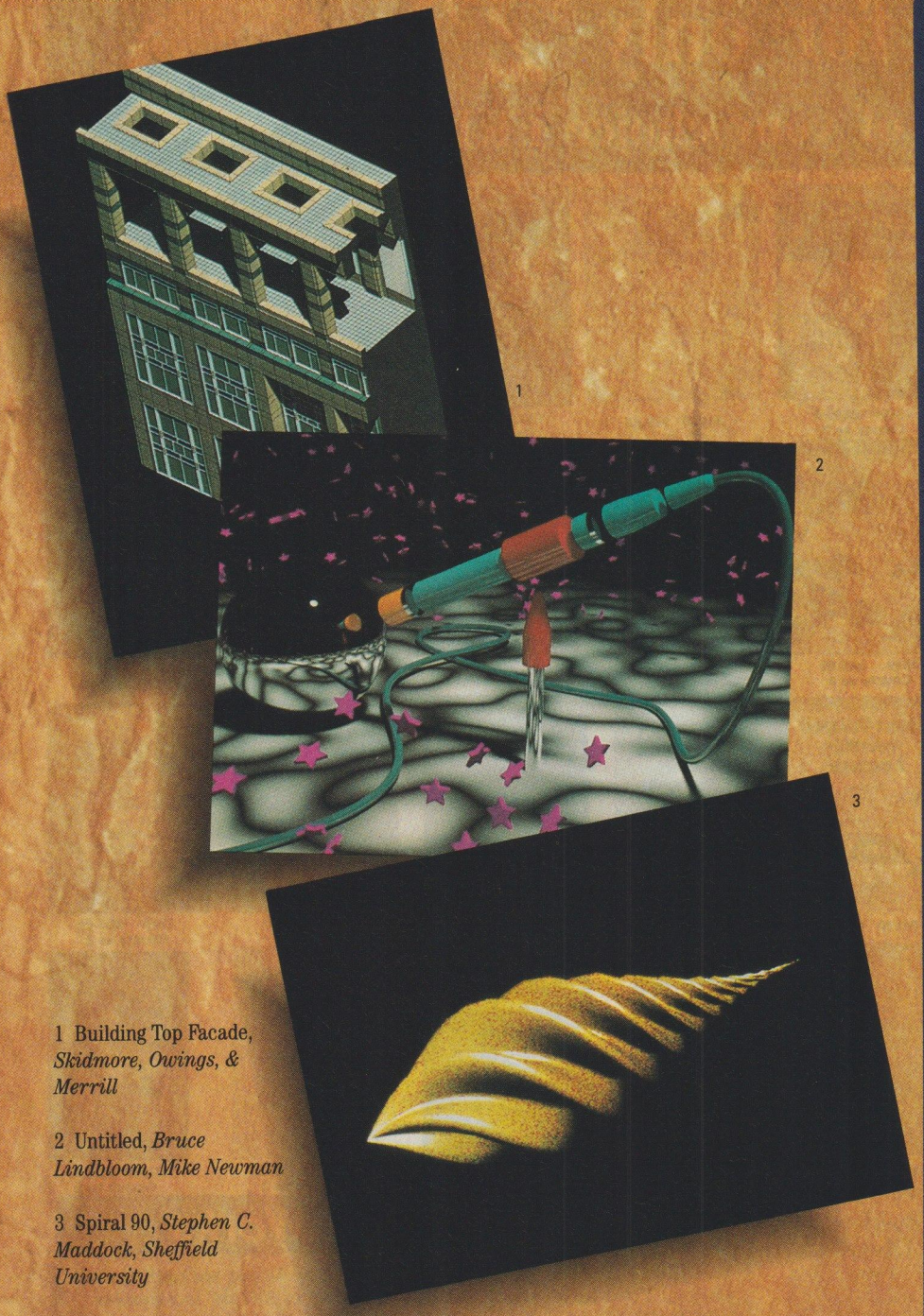

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CIRCLE NO. 147 ON INQUIRY CARD

Dr. Rebecca Thomas

READERS RESPOND TO RECENT CONTRIBUTIONS

Presented this month are three contributions providing feedback to recent columns. Lee Brown sends us two of the items, which relate to my November 1990 column. The first is an enhanced version of `tprint` and the second a more sophisticated make file generator. Finally, Chris Hare contributes the complement to `chkfiles`, which was originally published in my September 1990 column. His program changes the ownership and permissions of named files to be as specified in a database.

New and Improved AutoFormatter

Dear Dr. Thomas:

Your `tprint` script published in the November 1990 issue looks like a handy function to have around, but the implementation shown can be improved in both function and performance.

To begin with, the implementation performs from three to five passes through each input file to look for telltale macros. I often have several very large files comprising my `troff`-formatted documents and I would prefer to make, at most, only one pass. Because we want to look for several different tokens and take a different action based on which tokens we find, `grep` is not the best tool for the job. However, `awk` easily obtains all the requisite information in one pass and even lets you "bail out" as soon as enough information has been gathered.

Similarly, using `cat` as a "preprocessor" when neither `pic` nor `tbl` is required is a nice convenience for the programmer, but a waste of the user's time. (Okay, a very small waste.)

[*Doctor's comments:* Although my approach used multiple passes through the input file, this search phase only takes a fraction of the total time—most of it is spent by `troff` processing and the printing operation itself. For example, when using my `tprint` program on a 500K file, 20 seconds were spent setting up the command pipeline, but the formatting and printing took almost ten minutes. So, Mr. Brown's single-pass approach, which reduces command set-up time by a few seconds, only makes a small percentage gain in speed.]

The next problem is an interface model conflict: because `tprint` is really a replacement for `troff`, its usage and semantics should conform to those of `troff`. The original implementation (1) does not allow `troff` flags, and (2) prints each file separately instead of concatenating them as `troff` would do.

[*Doctor's comment:* My `tprint` program was suitable for my purposes, which only involved processing files in a standard way. Mr. Brown's program is welcome as a more general-purpose tool.]

Lastly, the test for the memorandum macro package will determine, perhaps erroneously, that this package is

LISTING 1: Here's an enhanced version of the `tprint` program originally published in my November 1990 column. This program determines which macro package and preprocessors are necessary to format a `troff`-input document file. It also specifies a postprocessor, which in this example converts `troff` output to PostScript.

```
:
#  @(#) tprint2  Format and print document automatically
#  Author:  Lee Brown, November 1990
#           based on tprint by Becca Thomas and Ray Swartz
#  Usage: tprint [-v] [troff_flags] file...
#  Define defaults (customize for site):
picflags="-T300 -D"
tblflags=
trfflags="-Tsc -F/usr/lib/font"
postproc="postsc | lp"
macro=
#  Parse arguments (compound flags not allowed):
for arg in "$@" ; do
    case "$arg" in
    -m*)    macro="$arg" ;;
    -v)     verbose=y ;;
    --)     shift 1; break ;;
    -*)     trfflags="$trfflags $arg" ;;
    *)      break ;;
    esac
    shift 1
done
#  Construct formatting command pipeline:
cmd='awk '
BEGIN {
    PicUsed = "n"; TblUsed = "n";
}
#  Look for telltale macros
$1 == ".LP" { if ( Macro == "" ) Macro = "-ms" }
$1 == ".VH" { if ( Macro == "" ) Macro = "-mv" }
$1 == ".P"  { if ( Macro == "" ) Macro = "-mm" }
$1 == ".TH" { if ( Macro == "" ) Macro = "-man" }
$1 == ".PS" { PicUsed = "y" }
$1 == ".TS" { TblUsed = "y" }
#  Stop searching if we have enough information:
{
    if ( Macro != "" && PicUsed != "n" && TblUsed != "n" )
        exit
}
```

continued

needed whenever any macro with a name beginning with "P" is used, for example, ".PP" or ".PS."

[*Doctor's comment:* My oversight, which can easily be fixed using the pattern `'^\.P$'` instead of `'^\.P'` with `grep`.]

The attached rewrite of `tprint`, named `tprint2`, is a shell script wrapper for an `awk` program [See Listing 1]. Because most files will not have `pic` and `tbl` macros, it is likely that a complete pass through all files will be required. But, that is better than three to five complete passes and is the optimal worst case. The rewrite also conforms to the `troff` syntax and semantic model, and so embraces the "principle of least surprise." And, no extra commands are ever put into the pipeline.

Some comments on the rewritten script are in order:

- Various items that are likely to be customized at each site are specified at the top using variables.
- We allow any `troff` flag, but watch carefully for `-m` as in the original script. We also support a `-v` flag because it's a good idea to be able to see the final `troff` invocation command line. Other flags are simply appended to the default `troff` flags.
- The `awk` script makes one pass through the concatenation of the input files. It stops once it has identified the macro package and has found both `pic` and `tbl` constructs. Once it stops examining the input files, either because it has exhausted its input or because it has found out all it needs, it performs the END clause, which constructs the formatting command pipeline and writes that command string to standard output, which is assigned to the `cmd` shell variable.
- When the `awk` script is invoked, the `Macro` (`awk`) variable is assigned the value stored in the `macro` shell variable.
- Finally, the command pipeline and the postprocessors are executed using the `eval` command, which allows for variable substitution prior to command parsing. Note that the `cmd` variable is likely to have the shell pipe (`|`) metacharacter in its value.

The new `tprint2` program could still be improved by (1) adding support for `eqn(1)` and possibly other macro packages, (2) adding a mechanism for overriding the defaults for the various processors' flags, and (3) adding a means to select an alternate postprocessor command.

continued

Listing 1 continued

```
40  #  Construct command and write it to stdout:
41  END {
42      files = "$* ";
43      if ( PicUsed == "y" ) {
44          printf "pic $picflags %s| ", files; files = "";
45      }
46      if ( TblUsed == "y" ) {
47          printf "tbl $tblflags %s| ", files; files = "";
48      }
49      printf "troff $trfflags %s %s", Macro, files;
50  }' Macro="$macro" $*`
51  #  Display and execute command pipeline:
52  if [ "$verbose" = "y" ]; then
53      eval echo \"$cmd \| $postproc\"
54  fi
55  eval $cmd \| $postproc
```

LISTING 2: Makefile generation can be automated to some extent. The `mkmk` Bourne shell program uses C, Lex, and Yacc source file names in the current directory along with included file preprocessor directives to construct a make file.

A. Listing of the `mkmk` *program, which prints a make file on the standard output:*

```
 1  :
 2  # @(#) mkmk  A make file generator
 3  # Author:  Lee Brown  12/13/90
 4  # with thanks to Mansour G. Raad (UNIXWORLD 11/90)
 5  USAGE="mkmk [target]"
 6  # Edit next few lines to customize this script.
 7  : ${CFLAGS:=-O}             # C compiler flags
 8  : ${LDFLAGS:=}              # linker flags
 9  : ${LIBS:=}                 # libraries
10  : ${INCLDIR:=/usr/include}  # std include directory
11  # Define editing function for include dependencies:
12  # (Adds a backslash to every line except the last
13  # and indents every line except the first.)
14  add_continuation()
15  {
16      read oldline
17      while read newline ; do
18          echo "$oldline\t\\"
19          echo "\t\c"
20          oldline="$newline"
21      done
22      echo "$oldline"
23  }
24  # Define function to get the basename without any suffix:
25  # (Assume one-character file name suffixes.)
26  rawname()
27  {
28      expr "$1" : '\(.*\)\..'
29  }
30  # Determine TARGET name from parameter or
31  # current directory basename:
32  case $# in
33      0)  cwd=`pwd` ; TARGET=`basename ${cwd}` ;;
34      1)  TARGET="$1" ;;
35      *)  echo "Too many parameters\nUsage: ${USAGE}" >&2
36          exit 1 ;;
37  esac
38  # Determine source file names (allow C, lex, and yacc):
39  set -- *.[cly]
40  SOURCES="$*"
41  if [ -z "${SOURCES}" ] || expr "${SOURCES}" : '\*.*' > /dev/null
42  then
43      echo "No source files in current directory" ; exit 2
44  fi
45  # Construct object file names:
46  for file in ${SOURCES} ; do
47      OBJECTS="${OBJECTS}`rawname ${file}`.o "
48  done
49  # Write make file prologue to stdout:
50  echo "#
51  #  Makefile for ${TARGET}
52  #
```

continued

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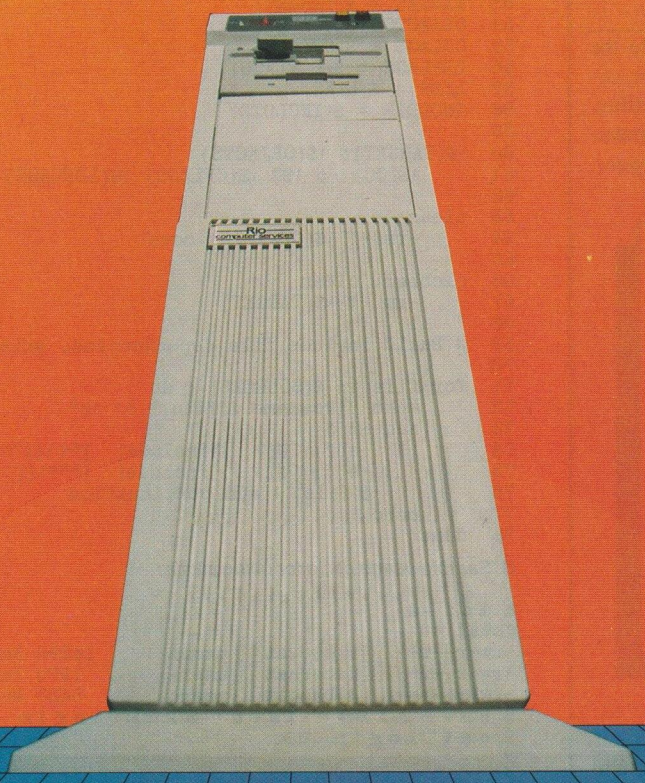

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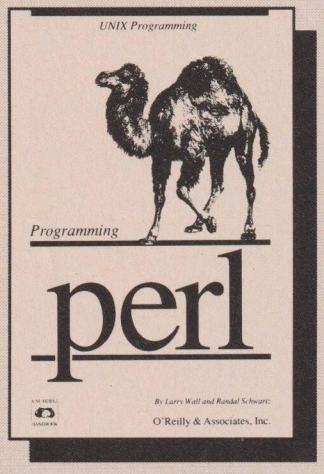

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Listing 2 continued

```
53  TARGET = ${TARGET}
54  OBJECTS = ${OBJECTS}
55  CFLAGS = ${CFLAGS}
56  LDFLAGS = ${LDFLAGS}
57  LIBS = ${LIBS}
58  INCLDIR = ${INCLDIR}
59
60  \$(TARGET): \$(OBJECTS)
61      \$(CC) -o \$@ \$(CFLAGS) \$(LDFLAGS) \$(OBJECTS) \$(LIBS)
62
63  clean:
64      -rm -f \$(OBJECTS) core
65
66  clobber: clean
67      -rm -f \$(TARGET)
68  "
69  # Build include file dependencies, write to stdout:
70
71  for file in ${SOURCES} ; do
72      echo "`rawname ${file}`.o: \c"
73      sed -n \
74          -e 's/^#[   ]*include[  ]*<\([^>]*\).*/$(INCLDIR)\/\1/p' \
75          -e 's/^#[   ]*include[  ]*"*\([^ "]*\).*/\1/p' \
76          ${file} | add_continuation
77      echo
78  done
```

B. Sample usage cycle for using mkmk*:*

```
$ ls -l
total 40
-rw-r--r--   1 beccat   users      14290 Jan  5 13:01 login.c
-rw-r--r--   1 beccat   users       1970 Jan  5 13:07 login.h
-rw-r--r--   1 beccat   users       3423 May  3  1990 timeday.c
$ env "LIBS=-lsec" mkmk login > login.mk
$ cat login.mk
#
#  Makefile for login
#
TARGET = login
OBJECTS = login.o timeday.o
CFLAGS = -O
LDFLAGS =
LIBS = -lsec
INCLDIR = /usr/include

$(TARGET): $(OBJECTS)
        $(CC) -o $@ $(CFLAGS) $(LDFLAGS) $(OBJECTS) $(LIBS)

clean:
        -rm -f $(OBJECTS) core

clobber: clean
        -rm -f $(TARGET)

login.o: $(INCLDIR)/sys/types.h         \
        $(INCLDIR)/signal.h             \
        $(INCLDIR)/pwd.h                \
        $(INCLDIR)/ctype.h              \
        $(INCLDIR)/stdio.h              \
        $(INCLDIR)/utmp.h               \
        login.h                         \
        $(INCLDIR)/shadow.h

timeday.o: $(INCLDIR)/time.h            \
        $(INCLDIR)/ctype.h
```

continued

Better File Making

The make file generator featured in the November 1990 issue provides only the first two levels of dependencies for a program product—the dependency of the target executable on object files and their corresponding dependencies on source files. It assumes that each source file depends on *all* header files, which is not necessarily true. For a large program product, determining the accurate header file dependencies is both advantageous and a nuisance.

The accompanying make file generator, `mkmk`, produces a make file on its standard output that handles the three dependency levels, plus provides some

Listing 2 continued

```
$ make -f login.mk
       cc -O -c login.c
       cc -O -c timeday.c
       cc -o login -O  login.o timeday.o  -lsec
$ ls -l
total 239
-rwxr-xr-x   1 beccat   users      82528 Jan  5 13:44 login
-rw-r--r--   1 beccat   users      14290 Jan  5 13:01 login.c
-rw-r--r--   1 beccat   users       1970 Jan  5 13:07 login.h
-rw-r--r--   1 beccat   users        499 Jan  5 13:44 login.mk
-rw-r--r--   1 beccat   users      12553 Jan  5 13:44 login.o
-rw-r--r--   1 beccat   users       3423 May  3  1990 timeday.c
-rw-r--r--   1 beccat   users       3149 Jan  5 13:44 timeday.o
$ □
```

LISTING 3: The `fixfiles` program allows an operator (with superuser privilege) to change owners and modes of any file that is referenced by a particular database.

A. Command-line syntax for the `fixfiles` program:

```
fixfiles [-q][-f filelist] [-a|-l listfile | filename...]
```

B. Contents of a sample file database:

```
-rw-r--r--      root        sys         /etc/motd
-rw-r-lr--      root        other       /etc/save.d/filelist
-r-xr-sr-x      root        other       /local/Testing/mail
drwxr-xr-t      root        other       /local/Testing/Test
-rw-rw----      beccat      mail        /usr/mail/beccatsh          X
-rw-r--r--      beccat      users       /home/beccat/.plan
-rw-rw-r--      beccat      users       /home/beccat/.profile
drwxr-x---      beccat      users       /home/beccat/Lists
drwxr-xr-x      beccat      users       /home/beccat/Test
```

C. Contents of a sample file name list:

```
/etc/motd
/etc/save.d/filelist
/local/Testing/mail
/local/Testing/Test
/usr/mail/beccatsh
/home/beccat/.plan
/home/beccat/.profile
/home/beccat/Lists
/home/beccat/Test
```

D. The `fixfiles` shell script:

```
 1  :
 2  # @(#) fixfiles v1.1 - correct discrepancies found by chkfiles
 3  # Author: Chris Hare, Dec. 1990
 4  # Based on chkfiles by Rebecca Thomas, Sep. 1990
 5  # Define constants:
 6  FILELIST=/secure/filelist     # Secure filelist database
 7  MAILTMP=/tmp/'basename $0'$$  # Mail message file
 8  MAILTO=root                   # Account name of auditor
 9  TERMINAL=/dev/null            # Initialize for non-interactive use
10  QUIET=No                      # Do we show prompts?
11  AFLAG="" LFLAG=""             # Initialize option flags
12  USAGE="Usage: $0 [-q][-f filelist] [-a|-l listfile | filename...]"
```

continued

convenient make file targets. My `mkmk` program uses three environment variables, if they exist, to override the defaults it would otherwise use for `CFLAGS`, `LDFLAGS`, and `LIBS`.

[*Doctor's notes:* Part A of Listing 2 shows the `mkmk` program. Part B shows a sample usage, where I create a make file to build Pat Wood's `login` program, which was introduced in my August 1990 column. Here I use `env` on the command line to define the environment variable `LIBS` to have the value `-lsec`. Also, the "blank" square brackets in the `sed` command on lines 74 and 75 actually contain a space and a tab character.]

One of the trickier parts of the script was providing attractive output of the header file dependencies, one per line

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(for easier correction if necessary). I decided to put the line continuation formatting, which requires one line look-ahead, in a function to separate that work from the extraction of header file names. I believe this approach makes the latter part of the script easier to understand.

Similarly, I frequently needed to alter file name suffixes, so I provided a function to return the file name without the suffix. I know that all of the file names this function will see have a one-character suffix, so a simple `expr(1)` command does the job.

Then, I determine the target name and the names of the source files in this directory (all of which we presume to contribute to the target). Next, I convert the source file names to object file names, using the `rawname()` function.

The next step is to write the first part of the make file. The "clean" and "clobber" targets are commonly used rules for cleaning the directory after a build has been done.

Finally, I go through each file and determine its header file dependencies. The `sed(1)` command extracts file names from include directives, adding the standard system include directory to the front of header files named between the "<" and ">" symbols. Note that the bracketed white space includes space and tab characters. In my

Listing 3 continued

```
13  # Trap signals to remove temp file then exit
14  trap "echo $0 aborted!; rm $MAILTMP 2>/dev/null; exit 0" 1 2 3 15
15  # If running interactively display messages on terminal:
16  [ -t 1 ] && TERMINAL=/dev/tty # if stdout is a terminal
17  # Define function to send and (perhaps) display message:
18  sendmsg() { echo $1 | /bin/tee -a $MAILTMP >$TERMINAL; }
19  # Function to provide octal equivalent of permission string:
20  fixperm() {
21      echo $1 | awk '{
22          count = 0               # loop counter
23          LENGTH = 9              # Number of loop iterations
24          modestr = substr($1, 2, 9)  # ignore the file type
25          while (count++ < LENGTH) {
26              symbol = substr(modestr, count, 1)
27              if (count >= 1 && count <= 3) { # owner
28                  s_value = 41;   multiplier = 100
29              }
30              if (count >= 4 && count <= 6) { # group
31                  l_value = 200; s_value = 201; multiplier = 10
32              }
33              if (count >= 7 && count <= 9) { # other
34                  t_value = 1001; multiplier = 1
35              }
```

continued

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CIRCLE NO. 176 ON INQUIRY CARD

Listing 3 continued

```
36              if (symbol == "r") perm_value = 4
37              if (symbol == "w") perm_value = 2
38              if (symbol == "x") perm_value = 1
39              if (symbol == "s") perm_value = s_value
40              if (symbol == "t") perm_value = t_value
41              if (symbol == "l") perm_value = l_value
42              if (symbol == "-") perm_value = 0
43              mode_value += (perm_value * multiplier)
44          }
45          printf "%s\n", mode_value
46      }' # end of awk script
47  } # end of function definition
48  # Function that (possibly) prompts user:
49  prompt () { [ "$QUIET" = "No" ] && echo "$1: \c" >$TERMINAL; }
50  # Function that fixes a specified file
51  fixfile () {
52      FILEPATH=$1 # store for posterity
53      [ -z "$FILEPATH" ] && return    # No name, leave function
54      set -- $FILEPATH    # Place function arg in posn. params.
55      if [ $# -eq 1 ]; then   # Reading file path name
56          # Specified full path name?:
57          if [ `expr "$FILEPATH" : "^/"` -ne 1 ]; then
58              sendmsg "$FILEPATH must be full path name"; return
59          fi
60          ENTRY=`egrep "  $FILEPATH\$|   $FILEPATH   X\$" $FILELIST`
61          if [ -z "$ENTRY" ] ; then
62              sendmsg "No database entry for $FILEPATH"; return
63          fi
64          # Place located database entry in positional parameters:
65          set -- $ENTRY
66      fi
67      if [ $# -lt 4 -o $# -gt 5 ] ; then  # invalid field count
68          sendmsg "\"$ENTRY\" corrupted in $FILELIST"; return
69      fi
70      REFMODE=$1 REFOWN=$2 REFGRP=$3 NAME=$4 EXIST=$5
71      if [ -f $NAME -o -d $NAME -o -b $NAME -o -c $NAME -o -p $NAME ]
72      then
73          sendmsg "Correcting $NAME ..."
74          chown $REFOWN $NAME 2>&1 | tee -a $MAILTMP > $TERMINAL
75          chgrp $REFGRP $NAME 2>&1 | tee -a $MAILTMP > $TERMINAL
76          PERMS=`fixperm $REFMODE`
77          chmod $PERMS $NAME 2>&1  | tee -a $MAILTMP > $TERMINAL
78      else
79          sendmsg "\"$NAME\" doesn't exist."
80      fi
81  }
82  # Process command line arguments, if any:
83  if [ "$OPTIND" = 1 ]; then  # Can use getopts
84      while getopts qf:al: flag ; do
85          case $flag in
86              q)  QUIET=Yes; TERMINAL=/dev/null ;;
87              f)  FILELIST=$OPTARG ;;
88              a)  AFLAG=Yes; QUIET=Yes; exec < $FILELIST ;;
89              l)  LFLAG=Yes; QUIET=Yes; exec < $OPTARG ;;
90              \?) echo $USAGE >&2; exit 1 ;;
91          esac
92      done
93      shift `expr $OPTIND - 1`    # shift options away
```

continued

environment, system header files may change; other sites may not need to worry about that and may delete the first sed editing command (on line 74). The output of the sed command is piped into the `add_continuation()` function for editing.

Lee Brown
Harris Computer Systems Division
Fort Lauderdale, Fla.

The Security Hole

Because security is becoming more and more important to computer users and administrators, we are providing a mini-section of this column devoted to UNIX system security contributions. Please look over the tools on your system and see if you have any that would meet or could be changed to meet our publication guidelines (see end of this column).

Fixing the Files

Dear Dr. Thomas:

After using your `chkfiles` one-machine file-owner-permission security audit script, I realized that it would

be handy to have a tool to reset the owners and/or permissions for the disk-based file(s) automatically. I'm providing a complementary script, named `fixfiles`, which provides this functionality. It obtains the list of files to fix either from a file, the invocation command line, or by prompting the operator. The user must provide the (full) path name—as it's specified in the file database. Once located, change-owner, change-group, and change-mode operations are done on the target file, using the information from the file database.

My `fixfiles` program recognizes the syntax shown [see Listing 3A]. The `-q` (quiet) option suppresses display of prompts and routine status messages on the terminal (unrecoverable errors are still reported before the script exits). Routine messages are mailed to the account listed by the `MAILTO` variable if terminal reporting is disabled. The file list database can be overridden using the `-f` option, where its argument names an alternate database file. Of course, the database file must be in the proper format [see Listing 3B].

The remaining options and arguments specify the files to be fixed. The `-a` option directs `fixfiles` to process all files in the file list database. Use the `-l` option, where its argument names a file that specifies a list of files, one file per line. Alternately, the operator can list the file path names on the script invocation command line. If none of these alternatives is employed, `fixfiles` will prompt the operator for the desired file (unless quiet mode is in effect).

[*Doctor's notes:* Part B of Listing 3 shows a small sample file list database and Part C the equivalent list file. The `fixfiles` source code is shown in Part D. Note that I've updated `chkfiles` and added an additional (fifth) field to the database entry: if it contains an "X," then the `chkfiles` script wouldn't report the file missing if it wasn't present on the disk. This is useful for suppressing reports for files that appear and disappear regularly, such as mailbox files, certain UUCP directories, etc. Part E shows the updated `chkfiles` script.

Overview of `fixfiles`: First, several manifest constants are defined that establish an "environment." By default, messages won't be displayed on the user's terminal (`TERMINAL` initialized to `/dev/null`). However, if standard output is a terminal device,

Listing 3 continued

```
else    # getopts not available, so parse manually:
    while [ $# -gt 0 ]; do  # while args to process
        case $1 in
            -q) QUIET=Yes; TERMINAL=/dev/null; shift ;;
            -f) if [ -z "$2" ]; then
                    echo "-f option requires an argument" >&2
                    echo $USAGE >&2 ; exit 1
                else
                    FILELIST="$2"; shift; shift
                fi ;;
            -f*)FILELIST=`echo $1 | sed 's/^..//'`; shift ;;
            -a) AFLAG=Yes; QUIET=Yes; exec < $FILELIST; shift ;;
            -l) if [ -z "$2" ]; then
                    echo "-l option requires an argument" >&2
                    echo $USAGE >&2 ; exit 1
                else
                    LFLAG=Yes;QUIET=Yes;exec < "$2";shift;shift
                fi ;;
            -l*)LFLAG=Yes; QUIET=Yes;
                exec < "`echo $1 | sed 's/^..//'`"; shift ;;
            --) shift; break ;;
            -*) echo "Unrecognized option: $1" >&2
                echo $USAGE >&2 ; exit 1 ;;
            *)  break ;;
        esac
    done
fi
if [ "$AFLAG" -a "$LFLAG" ]; then
    echo "Can't use both -a and -l options." >&2
    echo $USAGE >&2 ; exit 2
fi
if [ "$AFLAG" -a $# -gt 0 -o "$LFLAG" -a $# -gt 0 ]; then
    echo "Can't use file arguments with -a or -l option" >&2
    echo $USAGE >&2 ; exit 2
fi
# Must abort if there's no database:
if [ ! -f $FILELIST ]; then
    sendmsg "Cannot access file list database" ; exit 3
fi
# Process named files:
case $# in
    0)  prompt "Enter file name or control-D to quit"
        while read FILENAME ; do
            fixfile "$FILENAME"
        prompt "Enter file name or control-D to quit"
        done ;;
    *)  for FILENAME in $* ; do
            fixfile "$FILENAME"
        done ;;
esac
# (Possibly) make no report if no changes made:
[ ! -s $MAILTMP ] && sendmsg "\nNo changes made."
```

continued

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Listing 3 continued

```
146  # Send mail if no terminal notification:
147  [ "$TERMINAL" = "/dev/null" ] &&
148      mailx -s "Fix owner/group/permissions" $MAILTO < $MAILTMP
149  rm -f $MAILTMP 2>/dev/null
```

E. Updated `chkfiles` *script:*

```
 1  :
 2  # @(#) chkfiles  Check modes, owner, and group owner of files
 3  # Author: Rebecca Thomas, May 1990
 4  # Inspiration: Patrick Wood, Pipeline Associates
 5  # For security, define IFS and PATH and mark for export:
 6  # set -x    # Uncomment for debugging
 7  IFS='
 8  '; export IFS   # Space, tab, and newline between quotes
 9  PATH=/bin:/usr/bin; export PATH
10  # Define constants:
11  MAILTMP=/tmp/`basename $0`$$    # Mail message file
12  FILELIST=/Secure/filelist   # Default file list database
13  MAILTO=beccat                 # Account name of auditor
14  TERMINAL=/dev/null          # Initialize for non-interactive use
15  USAGE="Usage: $0 [filelist]"
16  # Catch signals, clean up, then exit:
17  trap 'echo "$0 interrupted"; rm -f $MAILTMP;exit' 1 2 3 15
18  # If running interactively display messages on terminal:
19  [ -t 1 ] && TERMINAL=/dev/tty   # if stdout is a terminal
20  # Define routine to display error message and exit:
21  abort() {
22      if [ "$TERMINAL" = "/dev/tty" ]; then   # Interactive
23          echo $1 >$TERMINAL  # write to terminal
24      else    # non-interactive so use mail
25          echo $1 | mailx -s "System files security audit" $MAILTO
26      fi
27      exit 1
28  }
29  # Process command line arguments, if any:
30  case $# in
31      0)  ;;                  # Use default file list
32      1)  FILELIST=$1 ;;      # Use specified file list
33      *)  abort "$USAGE" ;;   # No more than one argument
34  esac
35  # Be sure file list database is accessible:
36  [ -r "$FILELIST" ] || # Can't read file list database
37      abort "$0: Aborting, because can't access $FILELIST"
38  # Define function to send and (perhaps) display message:
39  sendmsg() { echo $1 | /bin/tee -a $MAILTMP >$TERMINAL; }
40  # Announce our intentions to interactive user:
41  echo "Checking system files ..." >$TERMINAL
42  # Loop through all entries in reference file database:
43  while read LINE ; do
44      [ -z "$LINE" ] && continue  # Skip blank lines
45      expr "$LINE" : '#' >/dev/null && continue # Skip comments
46      echo ".\c" >$TERMINAL   # Show user we're working
47      set -- $LINE    # Parse reference file entry
48      [ $# -lt 4 -o $# -gt 5 ] && {
49          sendmsg "Corrupted line: \"$LINE\" in $FILELIST"
50          continue ; }
51      REFMODE=$1 REFOWN=$2 REFGRP=$3 PATHNAME=$4 EXIST=$5
52      # Get current modes:
53      LISTING=`/bin/ls -ld $PATHNAME 2>/dev/null`
54      if [ -z "$LISTING" ]; then
55          if [ "$EXIST" != "X" ]; then
56              sendmsg "\n\"$PATHNAME\" in database, but not on disk"
57          fi
58          continue
59      fi
```

continued

`TERMINAL` is reset so messages will be displayed on the controlling terminal, `/dev/tty`.

Next, several functions are defined: `sendmsg()`, which appends its argument to a temporary file and (possibly) writes a copy to the user's terminal. This temporary file (named by the `MAILTMP` variable) is used to store the mail message that may be sent to the auditor account.

The `fixperm()` function is required to convert the permission mode string stored in the database, which is in `ls -l` symbolic format, to the octal equivalent used by `chmod`. The reformatting is done by an `awk` program, which handles all currently used System V mode symbols, including the recently introduced mandatory file-locking mode.

The `prompt()` function simply displays its argument (without a newline) on the user's terminal if quiet mode isn't enabled. This function is used to prompt the user for target file names interactively.

Now, `fixfile()` actually does the work of changing owner, group, and modes for a file. It can handle either a full path name or a database file entry. If the former, the database is searched for a matching entry. In either case the fields of the database entry are placed in named variables for convenient reference. If the target file exists, its owner, group, and mode will be changed to reflect the corresponding database entry. Note that in line 60 each blank space in the pattern for `egrep` is a tab.

Next we see the "main" routine, where execution actually begins. First command-line arguments are processed either by `getopts`, if available, or by using older (but more universal) shell constructs. Then checks are made for correct syntactic usage. If the target files aren't specified in a list or the database, the script sets up to process files either named on the standard input or on the invocation command line.

Finally, if there's no temporary mail message file, the operator is informed interactively that no changes were made. If the script is run non-interactively the file containing any change reports is mailed to the auditor.]

Chris Hare
Choreo Systems, Inc.
Ottawa, Ontario
Canada

Wanted: C Version of Combined chkfiles/fixfiles Program

Here's a small challenge for our C programming enthusiasts: submit a C program that combines the functionality of `chkfiles` and `fixfiles` (Listings 3D and 3E). The program should follow the guidelines published at the end of this column. However, I'm willing to relax the 100-line length restriction and allow up to 200 source lines. But, "smaller is more beautiful."

Mail shell scripts, C programs, or tips to ease the burden of system administrators, programmers, and

Listing 3 continued

```
60      set -- $LISTING
61      MODE=$1 OWNER=$3 GROUP=$4
62      # If not don't care, check to see if there are discepancies:
63      [ "$REFOWN" != "X" -a "$OWNER" != "$REFOWN" ] &&
64          sendmsg "\n\"$PATHNAME\" has $OWNER owner, should be $REFOWN"
65      [ "$REFGRP" != "X" -a "$GROUP" != "$REFGRP" ] &&
66          sendmsg "\n\"$PATHNAME\" has $GROUP group, should be $REFGRP"
67       [ "$MODE" != "$REFMODE" ] &&
68          sendmsg "\n\"$PATHNAME\" has $MODE mode, should be $REFMODE"
69  done < $FILELIST
70  #
71  # Send mail, if necessary:
72  if [ ! -s $MAILTMP ]; then  # no problem report file
73      echo "\nModes, owners, and group owners okay." |
74      tee $MAILTMP >$TERMINAL
75  fi
76  mailx -s "System files security audit" $MAILTO < $MAILTMP
77  rm -f $MAILTMP
```

users to: "Wizard's Grabbag," UNIX WORLD, 444 Castro St., Mountain View, CA 94041. Or submit via UUCP to:

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Briefly describe the hardware and software environment (especially the UNIX system version) on which the contributed code was run.

If possible, you should write code that is portable across the popular versions of the UNIX system (System V.X, 4.XBSD, XENIX). Write Bourne or Korn (but not C) shell scripts and use universally available utilities, for example, `who am i` (all systems) instead of `whoami` (Berkeley only). If feasible, use `getopts(1)` or `getopt(3C)` to process command-line options and their arguments.

Use the standard I/O library for structured modular C code. Check source code for nonportable constructions with `lint`. Eliminate hardware dependencies, such as terminal control sequences. (Use `termcap` or `terminfo`.) Isolate nonportable code to one region or a separate module. Keep examples compact (under 100 lines of code with each line less than 65 characters long—counting tabs as 4 spaces) and explanations concise (under 400 words). Use `sed` instead of `ed` scripts, pipelines instead of intermediate temporary files, etc. Be succinct! ■

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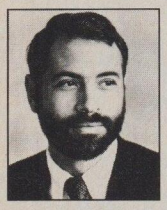

TIMED READS, SLASHES, AND ENVIRONMENTAL CHANGE

Richard Smith requests a shell `read` command that will exit if the user doesn't respond within a predetermined time. In response I provide a new command called `tread`. As a feedback item, Jerome Yablonkai, Jr. suggests an easier way to modify the file names (that contain slashes) discussed in my November 1990 column. Jeff Rosen submits a program that writes a script file that can be used to modify the environment of a shell process.

Time To Read

Question: I need to write a shell script application that requires a user to answer a prompt within a specified time period. That is, how do I modify `read` or write a command to accomplish this task?

Richard Smith
Kansas City, Kans.

Answer: Unfortunately, there is no option to the `read` command that tells the shell to wait a specified time and then have `read` fail. However, there are two ways to program this functionality. One is to include it directly in your shell script. The other is to write an external time-sensitive-read program that you use instead of the shell's built-in `read` command.

The October 1989 "Wizard's Grabbag" column presented a contribution that demonstrates the first approach. Sue Andarmani submitted `timed_read()`, a Bourne shell function that provides a time limit for waiting on user input for an interactive read. Before calling `read`, this function runs a background sub-shell that sleeps for a specified time interval. If the sleep expires, a user-defined signal is sent to terminate the parent shell, which has called `read`. If the user responds within the time interval, the `read` completes and the signal is ignored. The `timed_read()` function is reproduced in Listing 1A.

While `timed_read()` works, it has one shortcoming. Since it is implemented as a shell function, it is not available to anyone using the C shell since that shell does not support functions. However, it does work on the Korn shell.

A better solution is to write a custom replacement for the shell's `read` command. Listing 1B shows `tread`, a C program that provides a timed-read capability. By default, `tread` waits 10 seconds for the user to respond, though this time interval can be changed by a numerical argument. If the user enters a response within the time-out interval, `tread` writes the response to its standard output, which can then be assigned to the appropriate shell variable. If nothing is entered within the time limit, `tread` fails.

Before describing how `tread` works, let me review the UNIX signal mechanism, which is key to `tread`'s operation. Signals are used to notify a process that an event has occurred. One process can signal another or the kernel can initiate a signal for a process. Many different event types cause signals, such as pressing the interrupt key on your keyboard, using the `kill(1)` command or `kill(2)` system call, or attempting to divide a number by zero.

When a process receives a signal, it can do one of three things—terminate, ignore the signal, or execute some predefined signal-handler function. Generally, the default response is to terminate (4.3BSD provides different default actions for certain signals). Handling signals differently than the default requires you to explicitly state how you want that signal handled before the signal arrives. In Bourne or Korn shell scripts, this is done with the `trap` command. In the C Shell, signals are caught with `onintr`.

In a C program, a signal can be handled with the `signal(2)` system call. This function takes two arguments, the name of the signal and a function that says how to handle the signal. If you want the signal ignored, specify the `SIG_IGN` macro as the second argument. Alternately, use `SIG_DFL` to specify default handling. When using `signal(2)`, you have to include the header file `/usr/include/signal.h` (use `#include <signal.h>`). In `signal.h`, each signal number is assigned a name. Different UNIX versions may support different signals. Table 1 lists some commonly used System V signals.

As an example, call `signal(SIGINT, SIG_IGN)` to ignore the interrupt signal. To restore the default behavior use `signal(SIGINT, SIG_DFL)`. The `signal(SIGHUP,`

TABLE 1: Commonly used System V signals.

Name	*Number*	*Description*
SIGHUP	1	Hangup signal
SIGINT	2	Interrupt signal
SIGQUIT	3	Quit signal
SIGKILL	9	Kill signal (can't be caught or ignored)
SIGSYS	12	Bad argument sent to a system call
SIGPIPE	13	Broken pipe
SIGALRM	14	Alarm signal
SIGTERM	15	Software termination signal
SIGUSR1	16	User defined signal 1
SIGUSR2	17	User defined signal 2
SIGCLD	18	Death of a child process

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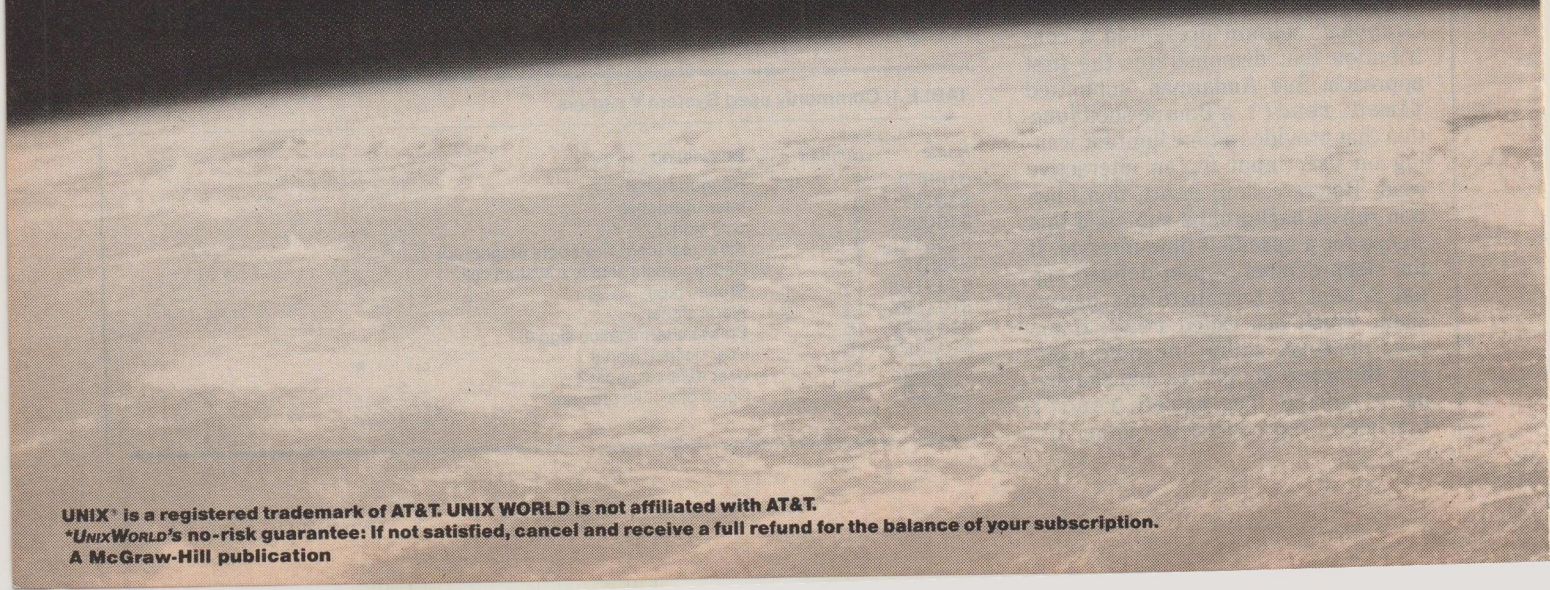

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hndlr) call specifies a function named hndlr(), which is called if the hang-up signal (SIGHUP) is received. Note that the hndlr() function must have been declared before calling signal().

Now our tread program sets an alarm (using the alarm(2) system call) and then attempts to read its standard input. If the alarm goes off, the kernel sends SIGALRM to tread, which terminates with an exit status that indicates failure. If the read completes before the alarm expires, the input string is printed to the standard output and the program terminates successfully. (The alarm is turned off if the process terminates before the alarm expires.)

The timedout() function is called if a SIGALRM is received. Note that if the command times out, tread exits with a status of 2 (two). All other errors are identified by an exit status of 1 (one).

In most cases, tread will be used to assign a value to a shell variable. To do this with the Bourne or Korn shell, tread is executed within back quotes and the output assigned to a variable, as in var=`tread`. With the C shell use the form set var = `tread`. Since no argument is sent to tread, this particular example command will wait ten seconds for a response before timing out. Listing 1C shows a simple script used to test tread.

LISTING 1: Timing out a read command can be done with either a shell function or a C program.

A. Reproduction of the timed_read() *shell function originally published in the October 1989 "Wizard's Grabbag" column:*

```
:
# timed_read  A function to time an interactive read
# Author: Sue Andarmani, May 1989
#
USAGE="Usage: $0 time_limit prompt trap_cmds variable_list"
#
timed_read() {
    if [ $# -lt 4 ]; then
        echo $USAGE >&2
        return
    fi
    lim=${1:-60}        # set time limit (60 sec. default)
    trap "eval $3" 16   # catch user-defined signal no. 1
    pid=$$              # store PID of current shell
    export lim pid      # make available to subshell
    eval echo "$2"      # issue prompt to user
    echo Enter response within $lim seconds: \\c # notify user
    # Use a subshell to send signal after sleep expires
    (sleep $lim; kill -16 $pid 2>/dev/null)& # in background
    eval read $4        # collect user input into $4
    trap "" 16          # disable trap after successful read
}
```

B. The C source code for tread*:*

```
#include <stdio.h>
#include <signal.h>

main(argc, argv)
int argc; char *argv[];
{
    char instr[BUFSIZ + 1];   /* input string */
    char *fgets();
    int delay = 10;       /* default delay is 10 seconds */
    int timedout();       /* handles alarm */

    if (argc > 2) {  /* only one argument allowed */
    fprintf(stdout, "Usage: %s [delay-secs]\n", *argv);
        exit(1);
    }
    if (argc == 2) { /* user specified time interval */
        delay = atoi(argv[1]);
        if (delay <= 0)  /* can only sleep for positive time */
            exit(1);
    }
    signal(SIGALRM, timedout);   /* set alarm handler */
    alarm(delay);                /* set the alarm */
    if (fgets(instr, BUFSIZ, stdin) == NULL) /* read */
        exit(1);  /* read fails because control-D entered */
    else {        /* read succeeds, print string */
        printf("%s", instr);  /* instr ends with a \n */
        exit(0);
    }
}

int timedout(signo)
int signo;
{
    exit(2);  /* exit with a time-out failure status */
}
```

continued

Easy Does It, Mac

In my November 1990 column, I spent a fair amount of space describing how to use fsdb to fix a file base name that contained a slash. The file name had been transferred from a Macintosh to a UNIX system via a network.

Jerome Yablonkai, Jr. offers an easier, more obvious solution applicable in his environment. Here is an excerpt from his letter: "Our network is comprised of UNIX machines and Macs running Appleshare. If the user copies a file with a slash (/) in it to her UNIX directory, it can be deleted (dragging it to the trash can) or renamed (by clicking on the file name) from the Macintosh. This seems to be an easier and safer way of handling any files that contain unusual characters."

Keeping A File On The Environment

In my January 1991 column, Ivica Crnkovia asked if there was a way for a child process to change the environment of its parent. Although, there is no direct way to accomplish this objective, reader Jeff Rosen has suggested a mechanism that allows one shell process to write a script file that another shell process can "source" to change its environment. Jeff also submitted the chgenv.c program (Listing 2) to demonstrate how his concept works.

The trick is to have the child shell process run a program that writes a file containing variable assignments and then have the parent shell "source" the file. By "source," I mean run the file's commands in the current shell. The Bourne or Korn shell do this with the dot (.) command, whereas the C shell uses a command named (appro-

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Listing 1 continued

C. A sample script for testing `tread`*:*

```
1  :
2  # test_tread  A simple script to test tread
3  # Author: Becca Thomas, Dec. 1990
4  #
5  echo "Enter first then last name"
6  fullname=`tread`
7  case $? in
8      0)  ;;
9      1)  echo "Nothing entered"
10         exit ;;
11     2)  echo "Timed out"
12         exit ;;
13 esac
14 echo "Full name is: $fullname"
```

LISTING 2: The `chgenv` program that allows one shell process to set up changes in another shell's environment.

```
1  #include <stdio.h>
2  char    *getenv(), *strcpy(), *strrchr();   /* declarations */
3  char    *pname;     /* storage for program name */
4  char *SccsID[] =
5    "@(#) chgenv.c Change environment; Jeff Rosen, Ray Swartz, 12/90";
6  main(argc, argv)
7  int argc; char *argv[];
8  {
9      void    outvar();      /* declare function that writes entry */
10     char    shell[20];     /* path name of shell being used*/
11     char    out_file[20];  /* base name of output file */
12     char    varname[100];  /* name of shell variable */
13     char    varstr[100];   /* value of shell variable */
14     char    *basename;     /* base name of shell being used */
15     char    *cp;           /* general character pointer */
16     int     csh;           /* using C shell flag (1 if csh) */
17     int     pid = -1;      /* pid used for output file name */
18     int     export = 0;    /* export flag (1 if exported) */
19     FILE    *fopen();      /* stream open routine */
20     FILE    *fptmp;        /* file pointer for temporary file */
21
22     pname = argv[0];  /* get program name */
23     if (argc == 1)     /* any argument specified? */
24         usage();    /* if not display correct usage */
25     if ((cp = getenv("SHELL")) == NULL)  /* SHELL in environment? */
26         strcpy(shell, "/bin/sh");  /* no, use default */
27     else
28         strcpy(shell, cp);  /* yes, use value from environment */
29     argc--;   /* skip the program name */
30     if (strcmp(*++argv, "-p") == 0) {   /* first arg -p? */
31         argc--;   /* yes, so skip to next arg */
32         /* error if no more args or pid <= 0 */
33         if (argc == 0 || (pid = atoi(*++argv)) <= 0) {
34             fprintf(stderr,
35                 "-p option must have valid pid argument\n"); exit(1);
36         }
37         argv++;   /* skip to next arg */
38         argc--;   /* decrement the argument count */
39     }
```

continued

priately enough) `source`.

One problem faced by `chgenv` is that the Bourne and Korn shells use one syntax and the C shell uses a different one to indicate variable assignment. The Bourne and Korn shells use the equal sign (=) with no surrounding whitespace, but the C shell uses the `set` command and an equal sign surrounded optionally by whitespace. Our `chgenv` program solves the discrepancy by the reading the value of the `SHELL` environment variable (using `getenv(3C)`) to determine the shell and then uses the appropriate assignment statement.

We send `chgenv` a list of variables to assign by means of name-value pairs. By default, `chgenv` assigns a local shell variable (one that can only be seen in the shell process that defined it). To identify that a variable

Listing 2 continued

```
40      if (argc == 0)  /* if nothing following -p SHELL */
41          usage();    /* that's also bad syntax */
42      /* create output file name */
43      sprintf(out_file, "/tmp/setvar%d",
44              (pid == -1) ? getppid() : pid);
45      /* open output file */
46      if ((fptmp = fopen(out_file, "a")) == NULL) {
47          fprintf(stderr, "Can't open temporary file\n"); exit(2);
48      }
49      if ((basename = strrchr(shell, '/')) == NULL) {
50          fprintf(stderr, "SHELL variable has no /\n"); usage();
51      }
52      basename++; /* move past the last slash (/) */
53      csh = ! (strcmp(basename, "sh") == 0 ||     /* Bourne shell? */
54               strcmp(basename, "ksh") == 0);     /* C shell? */
55      while (argc != 0) {  /* look through the remaining args */
56          if (strcmp(*argv, "-e") == 0) {  /* export flag? */
57              argv++; /* go to next arg */
58              if (--argc == 0)   /* if no arg for -e option */
59                  usage();    /* that's an error */
60              export = 1;         /* set export variable flag */
61          }
62          strcpy(varname, *argv++);   /* copy variable name */
63          if (--argc == 0)   /* no value for variable? */
64              usage();    /* that's an error */
65          strcpy(varstr, *argv++);    /* copy variable's value */
66          outvar(varname, varstr, export, fptmp, csh);  /* write */
67          export = 0;  /* reset export flag to no */
68          argc--;         /* update argument counter */
69      }   /* end while (argc != 0) ... */
70      fclose(fptmp);
71  }
72  /* write variable assignment into temporary file: */
73  void outvar(var, val, export, fptmp, cshell)
74  char    *var;   /* variable name */
75  char    *val;   /* value to assign variable */
76  int     export; /* export flag (1/0 = export/local variable) */
77  int     cshell; /* shell identity flag (1/0 = csh/sh */
78  FILE    *fptmp; /* where to write assignment */
79  {
80      if (!cshell) {   /* not C shell so use Bourne/Korn syntax */
81          fprintf(fptmp, "%s=\"%s\"\n", var, val);    /* var=val */
82          if (export) /* if variable to be marked for export */
83              fprintf(fptmp, "export %s\n", var); /* export var */
84      } else {   /* use C shell syntax */
85          if (export) /* if marked for export */
86              fprintf(fptmp, "setenv %s \"%s\"\n", var, val);
87      else    /* local variable */
88          fprintf(fptmp, "set %s=\"%s\"\n", var, val);
89      }
90  }
91  int usage()  /* display correct command line syntax */
92  {
93      fprintf(stderr, "Usage: %s [-p PID][-e] arg value...\n", pname);
94      exit(1);
95  }
```

should be marked for export to the environment, the name-value pair is preceded by a `-e`. Thus, the command line `chgenv -e a 5` says to assign `a` the value 5 and to export `a`. Note that the Bourne and Korn shells mark a variable for export with the `export` command, whereas the C shell uses `setenv` to both define and mark the variable in one operation.

To communicate with the shell process whose environment `chgenv` is trying to change, both that process and `chgenv` must agree on a file name. The file created by `chgenv` has the prefix `/tmp/setvar` and the process ID (PID) number is appended to the base name. Thus, if `chgenv` is invoked for altering the environment of process number 345, the file created by `chgenv` and sourced by the process is `/tmp/setvar345`.

By default, `chgenv` uses the PID of its parent shell process, but it also recognizes a `-p` option, which is followed by the PID of the process whose environment is to be changed. If this option is used, the output file created by `chgenv` will be named using the specified PID.

The `chgenv` program consists of two functions besides the `main()` routine. The `usage()` function prints a correct usage statement on the standard error and then causes the program to exit. The `outvar()` function takes arguments that tell it a variable's name (`var`), value (`val`), a flag that tells it whether the variable is to be exported (`export`), the file pointer for the open common-environment-script file (`fptmp`), and a flag identifying which shell format to use (`cshell`). Using this information, `outvar()` writes the appropriate variable assignment (and `export` command, if necessary) to the output file.

The `main()` routine parses the command line. It checks to make sure at least one command-line argument was supplied (line 23), if there is a `SHELL` variable in the environment (line 25), if the first argument is the `-p` option (line 30), if a numeric PID follows `-p` (line 33), if there is anything following a `-p` *PID* argument (line 40), if the temporary file can be opened (line 46), if the output is for the C shell (line 53-55), if the variable is to be exported (line 56), if there are any arguments after a `-e` (line 58), and if there is a value after the variable name (line 63). If all these tests are satisfied, `main()` calls `outvar()` to append the appropriate assignment statement to the output file. Note that the while loop in lines 55 to 69 loops once for each variable-value argument pair.

Guidelines: Obviously, this column will not be of much interest unless you send us your questions. Try to make your questions as general in interest as possible, and please no questions regarding specific hardware or third-party application packages. State the UNIX system version, if applicable, for the question at hand. Send your questions by surface mail to Ray Swartz, "Answers to UNIX," c/o UNIX WORLD Magazine, 444 Castro St., Mountain View, CA 94041. Or send them via e-mail to:

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Ray Swartz is the founder of Berkeley Decision/Systems, which specializes in C and UNIX training. His first book discusses using C for business applications, and his second book teaches shell programming using business-related examples.

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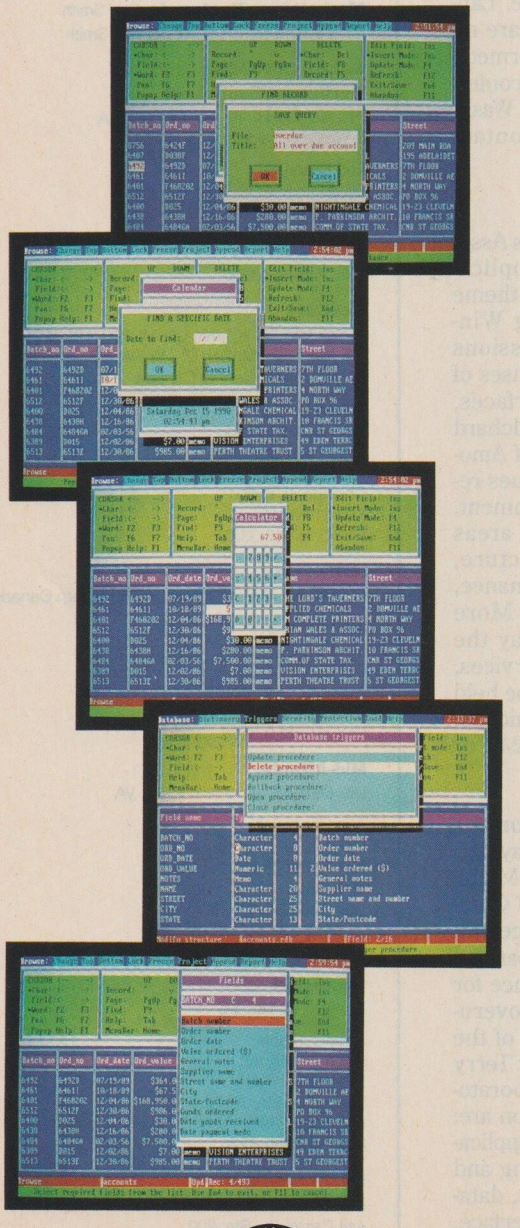

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The DigiChannel Modem/X is an AT bus-based board available with four or eight on-board Hayes-compatible modems, each running at 2400 bits per second. The card supports Bell 103, Bell 212A, V.22, and V.22*bis* modem standards; has an automatic answering feature, and supports tone or pulse dialing. Targeted applications include bulletin board systems, remote data collection, and simultaneous distribution of data. The Modem/X works with Digiboard's standard SCO UNIX and XENIX drivers. Cost of the four-modem card is $1,195, and $1,995 for the eight-modem card.

The DigiFax software lets terminal users send and receive faxes without resorting to a standalone fax machine. It schedules and spools transmissions, notifies the user when a fax arrives or transmission fails, and provides a log of fax usage for cost-accounting purposes. The software interfaces to word processing and spreadsheet software so that ASCII, TIFF, and international character text files can be transmitted as output from a word processing application using the product's Hewlett-Packard LaserJet Series II printer emulation. The software also includes scanner support. Requirements include EGA, VGA, or Hercules graphics cards, or an X Windows-based system; at least three megabytes of disk space on the host; and either a Hayes JTFax 9600 or Brooktrout Technology fax card. Cost is $495.

The NC/Con-16 terminal concentrator connects 16 serial ports over a TCP/IP system, allowing asynchronous terminals, modems, and PCs running terminal emulation software to connect to an Ethernet network at a speed of 38.4 kilobits per second. The TCP/IP protocol is incorporated into a ROM cartridge so that users can upgrade or incorporate different protocols easily. The NC/Con-16 supports Telnet so that each terminal can establish two virtual terminal sessions with any host on the network. Cost of the terminal concentrator is $2,195. **Digiboard, 6751 Oxford St., St. Louis Park, MN 55426; 612-922-8055.**

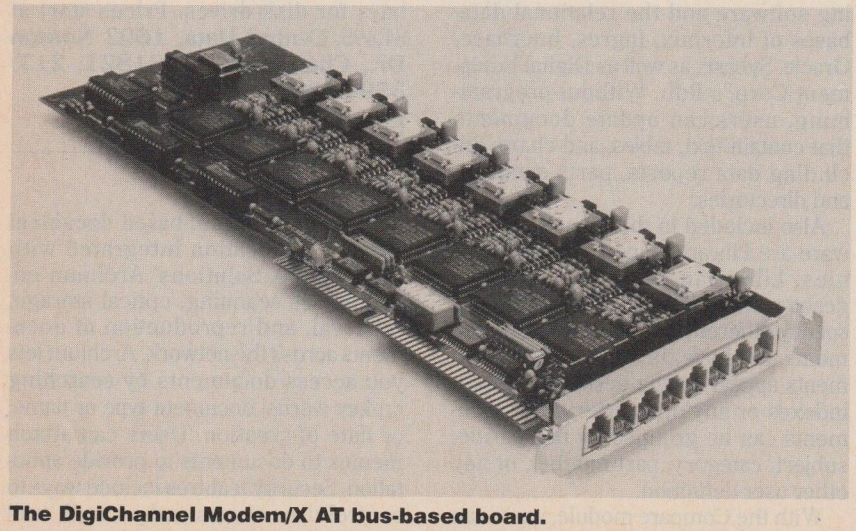
Circle No. 302 On Inquiry Card

As If I Really Wanted to Pay Taxes Sooner

As the day approaches when the United States government may request tax returns to be filed by computer, Serengeti Systems has prepared its 1040-Link for UNIX and XENIX systems. It's designed to take the place of IBM mainframe 3780 communications packages that require users to write complex script files and understand IRS communication specifications. In contrast, 1040-Link does not require script files and IRS specifications are in the default configuration. You can make any changes necessary through a menu-driven configuration system.

After installing 1040-Link, users need only know their IRS login ID and password, the IRS service center phone number, and the name of the file containing the appropriate returns. 1040-Link then initiates a dial-up session with the IRS host, transfers the user ID and password, exchanges files, and terminates the session. Serengeti is targeting original equipment manufacturers (OEMs) and value-added resellers (VARs) that would want to add 1040-Link to their own accounting and tax software packages. Cost is $595 for UNIX and XENIX versions, or $195 for DOS versions. Appropriate modems are also available from Serengeti or UDS. **Serengeti Systems, 808 W. 10th St., Ste. 101, Austin, TX 78701; 800-634-3122 or 512-345-2211.**

Circle No. 303 On Inquiry Card



The DigiChannel Modem/X AT bus-based board.

Bring on the VME for DSP

Digital signal processing (DSP) manufacturer Ariel has introduced a line of 10 VMEbus-based boards for DSP applications. Besides eight data acquisition and I/O boards for high-speed, multichannel data acquisition and audio I/O, the product line includes the V-56 and the QuadProcessor, both using Motorola's DSP56001 coprocessor boards.

The V-56 is a 13.5-mips signal processing card that can be combined with a variety of I/O modules to form a 6U form factor compatible with VME-based standalone systems, while the QuadProcessor is a 6U VME card with four 27-MHz DSP56001 processors.

continued

Both come with program development tools, including debugging monitor, Sun-3 device drivers, and Ariel Bug-56 (a symbolic debugger for the DSP56001). Prices start at $4,000 **Ariel, 433 River Rd., Highland Park, NJ 08904; 908-249-2900.**

Circle No. 305 On Inquiry Card

IPI in the Sky

Xylogics' SV6892 VMEbus-based disk controller supports the IPI-2 standard and currently supports Seagate Technology's Sabre parallel transfer disk. With a storage capacity of 2105 megabytes, the Sabre product uses eight read/write heads simultaneously for transfer rates of up to 24 megabytes per second. Target platforms for the disk and disk controller together are supercomputers, transaction-intensive mainframes, and workstations running high-resolution graphics applications. Single-user price for the SV6892 is $6,995, with OEM discounts available. **Xylogics, 53 Third Ave., Burlington, MA 01803; 617-272-8140.**

Circle No. 306 On Inquiry Card

The Aspects of Aptec

Speaking of high-performance computers, Aptec's FutureLink file server incorporates its UNIX-based I/O Computer with parallel channels and General Atomics' Unitree software, which implements the IEEE mass storage reference model. Running on the server, the Unitree software automatically migrates user files among magnetic disks, optical disks, tape libraries, and archival tapes, using site-specific migration algorithms. At the same time, the I/O Computer handles up to eight channels of data at sustained transfer rates of 10 megabytes per second per channel.

The FutureLink network interfaces include connections to UltraNet and the Network Systems HIPPI switch, as well as Ethernet and fiber distributed data interface (FDDI) support. Storage interfaces cover a variety of tape storage and disk arrays. Besides UniTree, other software components include access to TCP/IP, NFS, and FTP, and Wind River's VxWorks real-time UNIX operating system. System prices start at $300,000. **Aptec, P.O. Box 6750, Portland, OR 97228-6750; 503-626-9000.**

Circle No. 307 On Inquiry Card

Get This Data Out of Here

Andataco's zero-footprint disk-drive subsystem for SPARCstations incorporates a removable module holding a 340-megabyte, 3 1/2-inch disk drive. Targeting graphics applications that are expected to run on the SPARCstation 2 line, the company cites a data transfer rate of six megabytes per second and a 13-millisecond access time for the subsystem, which fits under the SPARCstation. List price is $6,000. **Andataco, 9550 Waples St., San Diego, CA 92121; 800-334-9191 or 619-453-9191.**

Circle No. 308 On Inquiry Card

SPARC in the Box

If you need more SBus cards than your SPARCstation can hold, Aurora Technologies' SBox expansion chassis adds flexibility in two ways. It incorporates four additional SBus slots for cards, and two SCSI ports for storage devices. The SBox matches the pizza-box form factor of the SPARCstation. List price is $2,195, with OEM discounts available.

For SPARC-compatible storage, Aurora has announced two external floppy disk drive products, the 3 1/2-inch FD350 and the 5 1/4-inch FD525, which attach to the SCSI port. The list price of $995 includes driver software and SCSI cable. **Aurora Technologies, 38 Sidney St., Cambridge, MA 02139; 617-577-1288.**

Circle No. 309 On Inquiry Card

SmartLeaf Blooms

Database Publishing Software has developed SmartLeaf software as a link between Interleaf's technical publishing software and the relational databases of Informix, Ingres, Interbase, Oracle, Sybase, as well as Digital Equipment Corp.'s Rdb. Without programming, users can update documents that contain text, tables, and charts, including data reports, parts catalogs, and directories.

Also included in the SmartLeaf software are Librarian and Compare modules. Librarian treats the Interleaf desktop like a database, letting the user specify different characteristics of documents and have the appropriate documents appear on the desktop to create indexes or any other overview. Documents can be grouped by name, title, subject, category, part number, or any other user-definition.

With the Compare module, users can put documents, computer-aides software engineering (CASE) tools, or other data side-by-side and produce a third document that exhibits differences between the two. It also allows users to do "redlining," that is, mark additions and deletions between the two documents. Cost of the software is $2,500, which runs on HP, Apollo, Sun, and Ultrix-based DEC hardware. **Database Publishing Software, 10 Speen St., Framingham, MA 01701; 508-820-2730.**

Circle No. 310 On Inquiry Card

SCSI Hosts andSCSI Guests

Targeting SCSI products for the SBus market, Central Data has introduced a host adapter, a port expansion board, and an expansion box. The SBus SCSI Host Adapter is installed in a SPARCserver 2 and adds two more SCSI channels to the original one on the server. It uses an NCR I/O processor to off-load the CPU and perform SCSI transactions on its own. Price is $1,795.

The SCSI Utility Module is an SBus-based board including two Centronics-compatible parallel ports, two serial ports with modem compatibility, and a floppy disk controller supporting 5 1/4-inch and 3 1/2-inch floppy disk drives. It comes mounted in a 5 1/4-inch drive bay chassis, with driver and cables, for $695.

The SCSI SubStations are external SCSI expansion boxes for SPARC-based systems incorporating the Utility Modules in external boxes. The SubStation/4 can handle two parallel ports, two serial ports, and two floppy disk drives. The SubStation/16 and SubStation/32 expand with varying configurations of serial ports and expansion bays for disk drives. Prices start at $1,495. **Central Data, 1602 Newton Dr., Champaign, IL 61821; 217-359-8010.**

Circle No. 311 On Inquiry Card

Quelle Storage

Designed as a Motif-based document storage application integrated with hardware, X.Solutions' Archium encompasses scanning, optical storage, retrieval, and reproduction of documents across the network. Archium lets you access documents by searching on key words, document type or name, or date of creation. Users can attach memos to documents to provide annotation. Security features include ways to control user access and an audit trail

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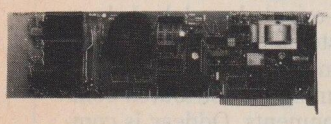

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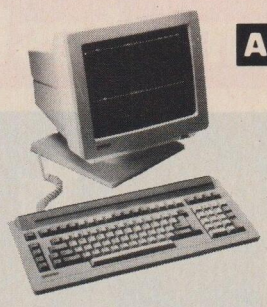

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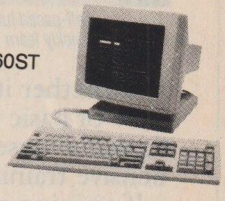

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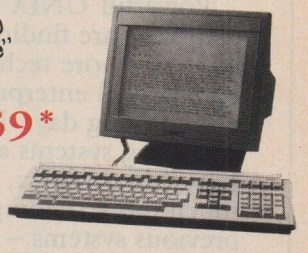

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that shows who has accessed documents and when.

The Archium system includes a flatbed scanner, a laser printer, and an optical drive for storage. Single-user prices start at $60,000 for a complete system with OEM discounts available. Platforms supported include Sun, Data General's Aviion, HP/Apollo, and SCO's Open Desktop. **X.Solutions, 415 Limpsfield Rd., Warlingham, Surrey, CR6 9HA, England; +44-81-655-3414 (voice) or +44-81-654-8492 (fax).**

Circle No. 312 On Inquiry Card

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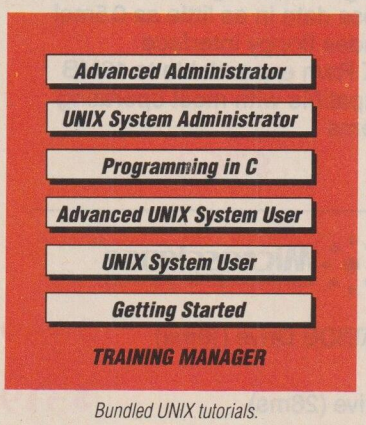

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CIRCLE NO. 114 ON INQUIRY CARD

Any Port in a SPARCstation

Vector Technologies VPX-128 multiplexer lets you connect seven serial devices and one parallel device to the RS-232 port on the SPARCstation. Each serial port on the multiplexer supports the Xon/Xoff flow control protocol for serial lines, as well as the CTS/RTS flow control protocol. Each port can be defined to operate between 50 baud and 38.4 kilobits per second.

The multiplexer also allows transparent device access via the standard UNIX `pty` interface, shared dial-in/dial-out modem access with UUCP-compatible port locking, and remote operation of devices through a cable or leased phone line. The multiplexer receives configuration information from the daemon on the host (including SPARCstations, Sun-3, or 386i workstations). Quantity one price is $1,195 and OEM discounts are available. **Vector Technologies, 3289 E. Hemisphere Loop, Tucson, AZ 85706-5028; 602-741-0120.**

Circle No. 313 On Inquiry Card

Embarking On An Oddesy

Using object-oriented models, Lohara Software Systems Oddesy CASE software is designed to develop application software running in distributed computing environments. Oddesy is comprised of four segments. Its Workbench encompasses hierarchical management, application modeling, and structure control; a 4GL takes care of the communications interface and interpretative needs. System management utilities include specification control, version management, security/access control; and a communications interface for multiprotocol support and port management. Platforms include SPARCstations and SCO UNIX-based PCs; supported protocols are TCP/IP and X.25. Prices start at $15,000. **Lohara Software Systems, 5703 Cochran Ave., Simi Valley, CA 93063; 805-522-5793.**

Circle No. 314 On Inquiry Card

It Sounds Like the Cinema of the Future, But It's Really a Cluster Controller

Equinox's Megaplex-96 cluster controller system lets you link 96 terminal users or serial devices into one slot on a UNIX-based PC. A Megaplex controller card fits into one AT or EISA slot in the PC, and connects externally to a 24-port multiplexer, called the CMX-24, which is

about the size of a cellular telephone. You can place up to four CMX-24s in proximity to the workgroup and as far as 2,500 feet away from the computer, running data over two twisted-pair cables.

On the CMX-24 is a proprietary reduced instruction set computing (RISC) chip to handle serial I/O communications, while each controller card has four 12-MHz RISC processors onboard. Equinox is targeting multiprocessing PC-based systems such as DEC's 433smp and Compaq's Systempro. A 24-port configuration, including one internal board and one external multiplexer, is $2,395; additional CMX-24 multiplexers cost $1,495 each. **Equinox Systems, 14260 S.W. 119th Ave., Miami, FL 33186; 800-328-2729 or 305-255-3500.**

Circle No. 316 On Inquiry Card

Master of the PS/2 Universe

Aox's OS/Master system uses its MicroMaster MCA boards and its OS/Master software running on the PS/2 to allow the user to access different operating systems simultaneously. The OS/Master software encompasses both a configuration program and a control program. The configuration program lets users select which MicroMaster board will run which operating system (DOS, OS/2, SCO UNIX, AIX, Novell Netware, or Microsoft LAN Manager); it also lets users choose which system resources are allocated to which MicroMaster board. The control program uses the configuration information to oversee resource sharing and switching between devices. Once both are running, users can hot-key back and forth between operating systems.

Depending on the megahertz rate of the 386 chip on the MicroMaster boards, the cost ranges from $1,495 to $2,495 per board. Users can install up to eight megabytes of 32-bit memory on the MicroMaster board to avoid taking up a slot in the PS/2 for memory. The OS/Master software starts at $235. **Aox, 486 Totten Pond Rd., Waltham, MA 02154; 800-232-1269 or 617-890-4402.**

Circle No. 317 On Inquiry Card

Raxco Rates Resources

Leaving the DEC-specific world for the first time, Raxco Software has developed NodeView, resource management software for heterogeneous networks. Resource management software differs from network management software in that it looks at utilization of resources. NodeView is designed to determine whether servers are overloaded or underused in terms of memory and storage, and to look at network traffic to see whether the network should be separated by bridges or gateways to improve performance.

In addition to tracking resource usage and traffic, NodeView can focus on specific workgroups or segments of the network. Before installation of new nodes on a network, you can conduct load-balancing tests to determine whether adding more nodes would

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have an optimal or detrimental effect. Platforms supported include VMS, Ultrix, Sun, DECnet, and TCP/IP. Reports can be compiled based on CPU type, operating system, node name, or time interval. Prices range from $4,500 for 15 nodes to $15,000 for 100 nodes. **Raxco Software, 2440 Research Blvd., Ste. 200, Rockville, MD 20850; 301-258-2620.**

Circle No. 318 On Inquiry Card

Would You Get to the Bottom Line?

Estimating the cost of software development is the goal of GEC-Marconi's Gecomo Plus software. It's designed to estimate costs for "real-world" software projects, taking into account concurrent stages of development, as well as current staff levels as opposed to "ideal" staff levels. Running under Motif, Gecomo Plus can generate project bar charts, milestone and development effort tables, histograms, and activity reports.

Available on Sun-3 and SPARCstations, HP/Apollo systems, and the IBM RS/6000, with prices ranging from $4,000 for a single-user to $12,500 for an unlimited-user license. **GEC-Marconi Software Systems, 12110 Sunset Hills Rd., Ste. 450, Reston, VA 22090; 703-648-1551.**

Circle No. 319 On Inquiry Card

The Scan What Can

RGB Spectrum's new RGB/Videolink 1450AX scan converter transforms high-resolution computer graphics into television broadcast format. Compatible with Sun, DEC, HP, IBM, and Silicon Graphics workstations, the 1450AX automatically synchronizes any computer signal with a horizontal scan rate of 21.5 to 80 kilohertz. Like RGB Spectrum's other scan converters, the 1450AX incorporates anti-aliasing, 24-bit color processing, and real-time operations. As a dedicated image processor, it accepts full-screen, non-interlaced RGB input; and provides genlock, sync generation, and encoding for output broadcast quality (NTSC or PAL) video. Cost is $14,995.

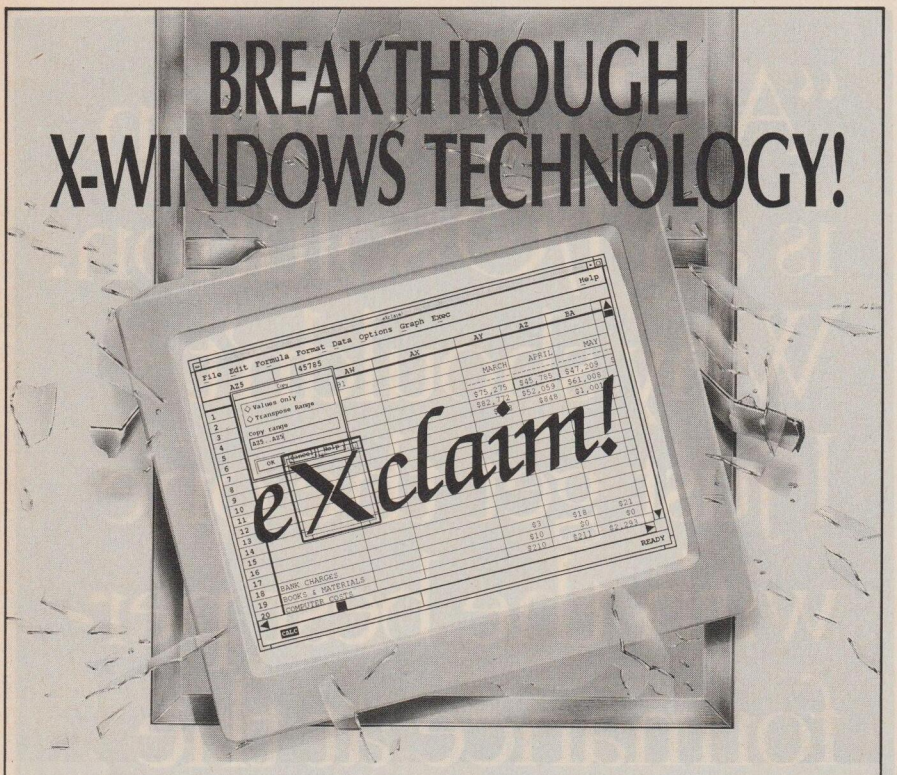
Also available is the RGB/View 2050, a video windowing system with built-in television tuner that provides you dual control of video and tuner functions either by software or from the front panel of the controller. The RGB/View 2050 is computer-independent and supports resolutions up to 1280-by-1024 resolution on Sun, HP, Silicon Graphics, DEC, and IBM workstations. Price is $9,495. **RGB Spectrum, 2550 Ninth St., Berkeley, CA 94710; 415-848-0180.**

Circle No. 320 On Inquiry Card

Hardware & Software Support

To **Control Data 4000 minicomputer**: Control Data's Ascent*X.25 communications software (800-272-3682 or 415-463-6868); Hewlett-Packard's SoftBench CASE tools (612-853-4124).

To **Cray supercomputer**: Empress' RDBMS (relational database management system) and 4GL (301-220-1919).



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CIRCLE NO. 69 ON INQUIRY CARD

To **Data General Aviion**: Cadre's Teamwork CASE software (401-351-5950); Interactive Development Environments' Software Through Pictures CASE tools (415-898-4051).

To **DECsystem 5100 server**: Camintonn's CMX memory expansion board in four- or eight-megabyte versions (714-454-6500); Dataram's DR-5100 memory expansion board in eight- or 16-megabyte versions (609-799-0071).

To **Force Computers' SPARCengine single-board computer**: Wind River Systems' VxWorks real-time operating system (415-748-4100).

To **Hewlett-Packard's HP/UX**: Unison's SpoolMate software for report distribution and spool file management (408-245-3000).

To **Hewlett-Packard 9000 workstations**: Ariel's DTK-300 digital signal processing development system using Motorola's 24-bit DSP56001 processor (908-249-2900); Control Data's Ascent*Link implementation of DEC's LAT protocol (800-272-3682 or 415-463-6868).

To **Motorola Delta Series 8000 server**: Informix's Wingz graphic spreadsheet and DataLink database interface (415-926-6300).

To **Next**: Digital Instrumentation Technology's FloppyWorks file transfer software for transferring Macintosh software to the Next workstation (505-662-1459).

To **Silicon Graphics**: Accelr8 Technology's 4D/Submit software to allow VMS connectivity for its servers via DECnet or TCP/IP (415-960-1980); Matra Datavision's Euclid-IS version 2.2 mechanical CAE/CAD/CAM software for its Iris workstations (508-640-0940).

To **Sony News workstation**: Syntax's LAN Manager-compatible LM-server software (206-833-2525).

To **Stratus XA2000 minicomputers**: Scientific Software's Network Express connectivity software for linking proprietary and UNIX networks (404-551-2551); and X.400 online messaging applications from ICL, Incotel, Marben, and Danet (508-460-2000).

To **SunNet Manager**: Intelligent Network Applications' NetMapper tool for creating, configuring and monitoring integrated networks (415-364-5282).

To **Sun**: Dataram's DR-470 memory expansion board in 32- or 128-megabyte versions for the SPARCserver (609-799-0071); Megatek's PHIGSengine 50S graphics accelerator for the SPARCstation (619-455-5590).

To **Wind River VxWorks real-time operating system**: Free Software Foundation's GNU development software (415-748-4100).

Hardware Upgrades

Advanced Technologies International is offering a plug-in bit image processor for its LC-6000 printers, so that faxes can be routed to the printer for output (408-942-1780).

Cisco Systems adds SDLC transport protocol capability to its internetwork routes for remote communication to IBM mainframes (415-326-1941).

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ment and automated storage strategy (DMASS) using the UniTree file and storage management system and Maximum Strategy's HIPPI data storage system to its Model 500 supercomputers (503-641-3151).

Network Resources Corp. improves configuration capabilities in its network management software and adds support for AppleTalk phase 2 in version 2.0 of its MultiGate 2000 hardware router and MultiGateMac software router (408-263-8100).

Solarix is offering a 386-based DOS coprocessor for running both operating systems on its Solarix/4 SPARC-compatible workstations (415-659-1544).

Sony offers the NWB-254 videomap display interface board for its News workstations so users can display real-time video in X Windows (408-434-6644).

Software Upgrades

Appgen adds windowing capabilities, programmable function keys, multi-valued function lines, and enhanced printing capabilities to version 1.8 of its Appgen business software development 4GL and database (800-231-0062 or 713-558-0338).

Fusion Systems Group has embedded Neuron Data's Nexpert Object expert-system tools into its Network Task Scheduler task-automation software for development of distributed computing applications (212-285-8001).

IXI has extended version 3.0 of its X.desktop Motif desktop manager to include "drag-and-drop" capabilities between the desktop and other applications, so that data can be imported into a running application. Also available are pre-configured user environments based on different skill and experience levels, and support of multicolored, three-dimensional and animated icons (+44-223-462131).

JYACC has released a Motif GUI builder for its JAM application development software; the Open Look GUI builder will be available in June (212-267-7222).

MMB Development adds dual menu windows (one for commands and one for topics) to release 2.0 of its TeamMate UNIX bulletin board development software, along with a content retrieval module (213-318-1322).

Quality Software Products adds a live link to Frame Technology's FrameMaker desktop publishing software, as well as support for international character sets and enhanced graphics capabilities (213-410-0303).

Sapro has added a pop-up windows interface, on-line help, and a browse feature to version 7.0 of its Impact manufacturing and accounting software, as well as enhanced the general ledger report writer, its engineering change control, and lot traceability (800-369-8649 or 714-541-2202).

Systems Enhancement Corp. has added event-logging and the ability for OEMs to add their own messages into its PowerMon version 1.2 UPS-shutdown notification software (314-532-2855).

V-Systems adds support for TIFF (tagged image file format), Motif, and

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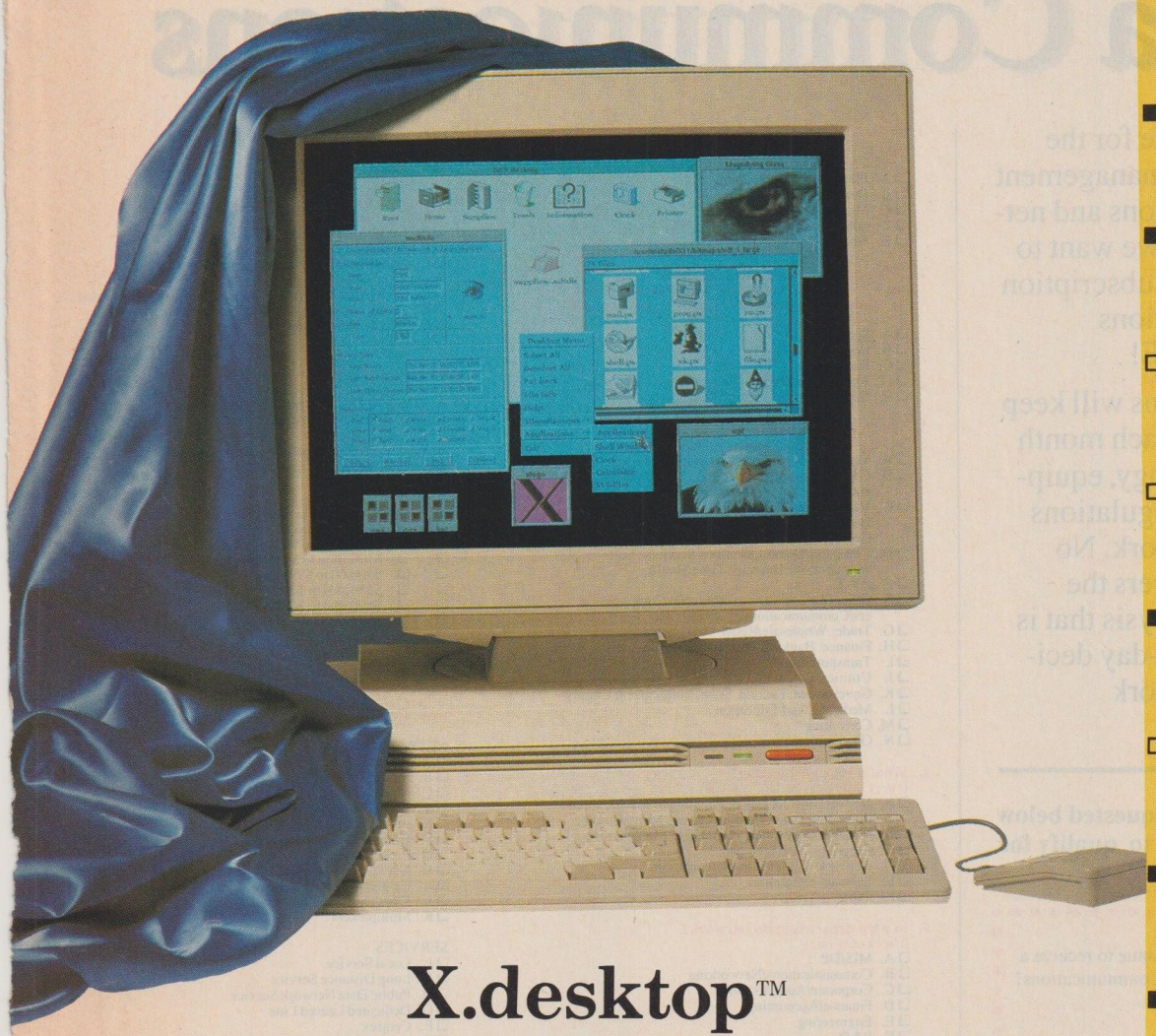

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1. What is the extent of your networking activity within your company or organization?
(check all that apply)
❑ A. Planning and Development
❑ B. Design and Implementation
❑ C. Management
❑ D. Other (Specify) _____
❑ E. No Involvement

2. Which of the following best describes your involvement in the purchase of data communications and networking equipment and services?
(check all that apply)
❑ A. Specify
❑ B. Recommend
❑ C. Purchase
❑ D. Approve Purchase
❑ E. None

3. Which is your company's primary business activity at your location? (Check only one)
❑ A. Manufacturing: Computers/Communications
❑ B. Carrier: Including AT&T, B.O.C.s, Independent Telcos, Public Data Networks
❑ C. Value Added Reseller/Dealer, System House/Distributor, Interconnect Company, Integrator, Computer/Communications
❑ D. Computer/Communications Services: Software, Service Bureaus, Time Sharing
❑ E. P.T.T.
❑ F. Other Manufacturing (other than Computers/Communications)
❑ G. Trade: Wholesale/Retail
❑ H. Finance: Banking, Real Estate, Insurance
❑ I. Transportation
❑ J. Utilities: Gas & Electric
❑ K. Government: Federal, State, Municipal & County
❑ L. Medical/Legal/Education
❑ M. Consulting
❑ N. Other _____

4. What is your job function?
(check only one)
❑ A. Networking Operation, Planning or Management (including Data Communications Management)
❑ B. MIS/DP Operations, Planning or Management
❑ C. Corporate Management
❑ D. Networks/Systems Implementation
❑ E. Systems Integration
❑ F. Other _____

5. In what department do you work?
(check only one)
❑ A. MIS/DP
❑ B. Communications/Networking
❑ C. Corporate/Administrative
❑ D. Finance/Accounting
❑ E. Engineering
❑ F. R&D
❑ G. Manufacturing
❑ H. Sales/Marketing
❑ I. Operations/Production
❑ J. Purchasing
❑ K. Distribution
❑ L. Education/Training
❑ M. Technical Support
❑ N. Consulting
❑ O. Other _____

6. What is your job title?
❑ A. Chairman, President, Owner, Partner, CEO
❑ B. Vice President, MIS/DP/Networking/Communications
❑ C. Vice President (all other VP's)
❑ D. Director, Department Head
❑ E. Manager, Supervisor
❑ F. Engineer
❑ G. Consultant
❑ H. Other _____

7a. How many Local Area Networks (LANs) are presently installed within your company/organization?
❑ A. More than 20
❑ B. 10-20
❑ C. Less than 10

7b. How many Local Area Networks (LANs) will be added over the next 12 months? (check only one)
❑ A. More than 20
❑ B. 10-20
❑ C. Less than 10

8. Is your network: (check only one)
❑ A. Local (within building/campus)
❑ B. Metropolitan
❑ C. Regional (several states)
❑ D. National
❑ E. International
❑ F. Other _____

9. Does your company's network include:
(check all that apply)
❑ A. Local Area Network (PC LANs)
❑ B. Minicomputer based LANs
❑ C. Mainframe LAN (micro to mainframe, mini to mainframe)
❑ D. Wide Area Network (including public data network)
❑ E. Public Network (including public data network)
❑ F. Bypass Network (private network)
❑ G. Other _____

10. Estimate value of network equipment and services:

A. Which you helped specify, recommend or approve in the last 12 months?

B. Which you plan to help specify recommend or approve in the next 12 months?

A	B	
❑	❑	$20 million or over
❑	❑	$10 million to $19.9 Million
❑	❑	$5 million to $9.9 million
❑	❑	$1 million to $4.9 million
❑	❑	$500,00 to $999,999
❑	❑	$250,000 to $499,999
❑	❑	$100,000 to $249,999
❑	❑	$50,000 to $99,999
❑	❑	under $50,000
❑	❑	None of the above

11. Which products and/or services do you help acquire, recommend, specify or buy?
(check all that apply)

NETWORKING EQUIPMENT
❑ A. Local Area Networks
❑ B. Modem (9.6 KBPs and over)
❑ C. Modem (under 9.6 KBPs)
❑ D. T-1/T-3 Equipment
❑ E. PBX/Data PBX (including data switches)
❑ F. Bridges/Routers/Gateways
❑ G. Packet Switches
❑ H. Network Management Systems
❑ I. Central Office Switches
❑ J. Fiber Optic Equipment
❑ K. Multiplexers

SERVICES
❑ L. Local Service
❑ M. Long Distance Service
❑ N. Public Data Network Service
❑ O. Dedicated Leased Line
❑ P. Centrex
❑ Q. Central Office LAN
❑ R. Satellite
❑ S. Fiber Optic
❑ T. Packet Switches
❑ U. ISDN Service

SOFTWARE
❑ W. Network Operating Systems
❑ X. Network Management
❑ Y. Communications Software
❑ Z. Applications Software
❑ 1. Call Accounting
❑ 2. Systems Software

COMPUTERS/PERIPHERALS
❑ 4. Microcomputers
❑ 5. Minicomputers
❑ 6. Mainframe
❑ 7. Front End Processors
❑ 8. Terminals
❑ 9. Printers

❑ 10. None of the above

12. What is the estimated annual revenue of your company?
(check only one)
❑ A. $1 billion and over
❑ B. $500 million to $999 million
❑ C. $100 million to $499 million
❑ D. $50 million to $99 million
❑ E. under $50 million

13. How many employees are in your company?
(check only one)
❑ A. 5,000 employees and over
❑ B. 1,000-4,999 employees
❑ C. 500-999 employees
❑ D. under 500 employees

MLL0000

PostScript and dot-matrix printers in its VSI*FAX 1.2 UNIX facsimile system (714-545-6442).

Wolfram Research has added 283 functions, including the ability to solve numerical differential equations, to version 2.0 of Mathematica, along with enhancements in programming, external application calling, and audio capabilities (217-398-0700).

Compilers & Development Kits

To **C**: Gimpel Software's C-terp C interpreter for 386-based UNIX computers includes a reconfigurable editor and a source-level interactive debugger, among other features (215-584-4261); IMSL's C/Base/Library of 140 user-callable functions (713-782-6060).

To **C++**: Compiler Resources' Yacc++ for Sun workstations (508-435-5016); Oregon Software's C++ for SVR4 (503-245-2202).

To **Eiffel**: version 2.3, level 4 of Interactive Software Engineering's Eiffel compiler, with enhancements to its libraries and tools, and the ability for programmers to write larger, more complex applications (805-685-1006).

To **IBM RS/6000**: Basmark's QuickBasic compiler (216-621-7650).

To **Intel 8051 embedded microcontrollers**: Archimedes Software's C-8051 cross-compiler version 4.0 adds variable allocation capabilities so that C programs can run without unnecessarily consuming RAM or using stack-operations (415-567-4010).

To **MIPS workstations**: Alsys' Ada Development Environment (617-270-0030).

To **National Semiconductor Series 32000 embedded processors**: Hewlett-Packard HP 64700 emulation and analysis tools (800-752-0900).

To **Sun SPARCstations**: Language Processors' LPI-Fortran v3.3 and LPI New C v1.24 (508-626-0006).

Product Line Extensions

To **Cheetah Computer Systems**: two 33-Mhz 486-based computers, one with eight megabytes of 35-nanosecond DRAM, with expansion up to 16 megabytes of DRAM (612-943-8690).

To **Network Computing Devices**: a 14-inch color X terminal for $3,000 (415-694-0650).

To **Tatung**: the TWS-5020-CX SPARC-compatible workstation enhanced with a Megatek graphics co-processor board, priced at $9,995 (408-435-0140).

To **Telebit**: the Telebit T1600 modem, compatible with CCITT's V.32, V.42/V.42*bis* standards and running at speeds up to 38.4 kilobits per second, priced at $795 (408-734-4333).

To **UltraStor**: the Ultra 22C EISA-compatbile ESDI caching disk controller with 512K of video RAM, expandable up to four megabytes, and support for SCO, AT&T, and Interactive UNIX, starting at $550 (714-581-4100).

To **Xylogics**: the Annex three-terminal server, built for expandability via daughterboards rather than through backplane additions, running both TCP/IP or LAT over asynchronous lines (617-272-8140). ■

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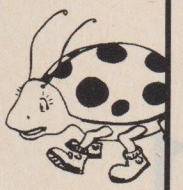

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continued from page 133

Ore. Contact Michael Cox, 503-690-1214.

Federal Computer Conference West: April 30-May 2
On the agenda of the Federal Computer Conference is the effect communications technologies have had in reference to defense and the government. Three featured presentations, one on each day of the conference, will incorporate a keynote speaker. Slated to speak are Bob Wainwright, managing partner, Data Protection Specialists, speaking on "Meeting the Computer Security Challenge"; Lois Zells, president, Lois Zells Associates, "Applying TQM to Serve Computer User's Needs"; and John McConnell, president, Interworking, Inc., "Achieving Interoperability Using TCP/IP and OSI."

Also scheduled are detailed seminars on micros and networking, interpretations of computing appli-cations, and how progress in micros and LANs (local area networks) has had an impact on the industry. Scheduled to attend are IBM, Texas Instruments, and WordPerfect. Topics to be analyzed are TQM, and computer security. Included with discussion are classroom tutorials with hands-on demonstrations. Between 80 and 100 exhibitors are scheduled. The conference will be held at the Disney Convention Complex, Anaheim, Calif. Contact Stephen O'Keeffe, 800-343-6944 or 301-587-9344.

22nd Annual Pittsburgh Conference on Modeling and Simulation: May 2-3
The emphasis for the 1991 Modeling and Simulation conference will be microprocessors, personal computer applications and software, artificial intelligence, expert systems, robotics, and all phases of control theory and applications. To be considered for discussion are issues of social, economic, geographic, regional, scientific, and global modeling and simulation. Slated are special sessions on microprocessors. The conference will be held at Benedum Hall, University of Pittsburgh, Pittsburgh, Pa. Contact William Vogt or Marlin Mickle, 412-624-9682.

NEXT MONTH IN UNIXWORLD

Making It on Your Own

Should you venture out on your own as a consultant? It's a question many readers ask. We look at the risks and rewards of working for yourself.

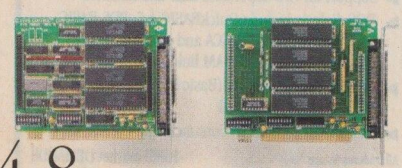
The Visionary of SGI

James Clark has risen from the aptly named town of Plainview, Texas, to become the founder and chairman of Silicon Graphics. How has he shaped SGI into the leading vendor of 3-D graphics workstations?

X Marks the Spot for Terminals

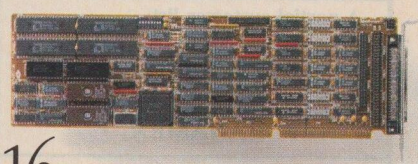
Combining the attributes of PCs, workstations, and terminals–X terminals bring a load of capability to the desktop. Find out how to weigh the relative merits and how they fit your needs.

Multiple-Choice



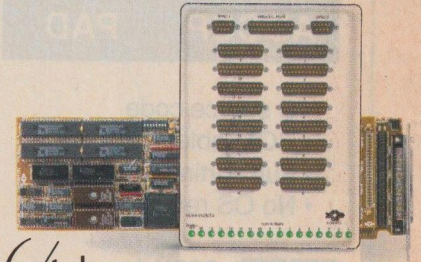
4-8

Our Hostess multiuser serial controllers are an excellent choice for up to eight occasional users. The Hostess 550 provides buffering for even higher performance. And for truly high performance, choose the Ultra 8.



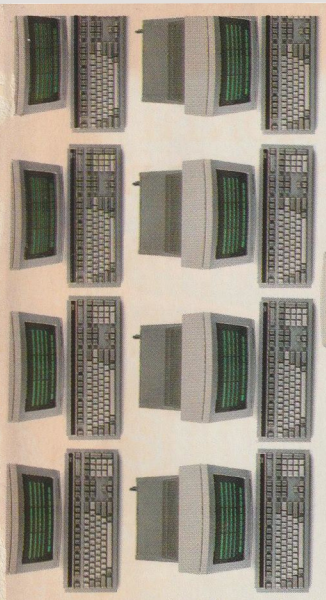
16

Expand up to 16 users with the Ultra 16 high performance intelligent serial controller. But if your multiuser requirements are more modest a 16 port Hostess 550 controller makes an equally intelligent choice.



64+

Our Ultra Cluster gives you the flexibility and power for virtually limitless growth. Starting with an Ultra 8 base board, you can expand 16 users at a time, while maintaining current levels of performance every step of the way.

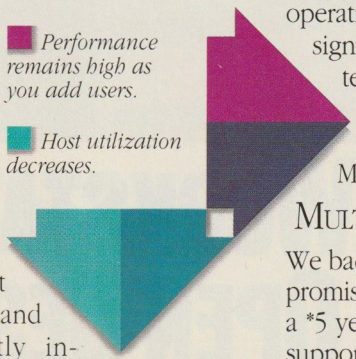


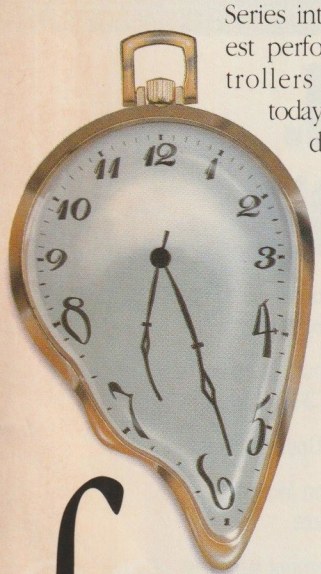
Multiply Your Choices

At Comtrol we pioneered multiuser technology. And we know that there are no single solutions to multiuser environments. That's why we offer more choices than any other company...from text to graphics...for modest users to over 64 users supported by a single PC. And we've not only multiplied your choices, we've multiplied performance, allowing you to expand without the high cost of adding computers.

Multiplied Performance

No company offers you more performance than Comtrol. In fact, our new DT *Express* driver transforms our Ultra Series into the highest performing controllers available today. DT *Express* dramatically reduces host utilization and significantly increases throughput by managing all data transmission and data transform functions on the controller. So now as you add users, no one gets caught in a wait state.





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When graphics enter the equation, MultiVision enters the picture. A fully functional multiuser system for up to 16 users, MultiVision speeds images to the screen at a blistering 100 megabits per second. As a result, you'll experience near instantaneous transmission of your graphics.

With software that enhances standard operating system graphics drivers, MultiVision is compatible with virtually any monitor, keyboard, mouse or VGA controller supported by the operating system. MultiVision can also run applications designed for the "X" environment. But unlike a LAN-based "X" terminal, MultiVision is a multiuser system that transfers data up to 100 times faster. When you compare that performance with the cost of an "X" terminal... MultiVision's advantages really compute.

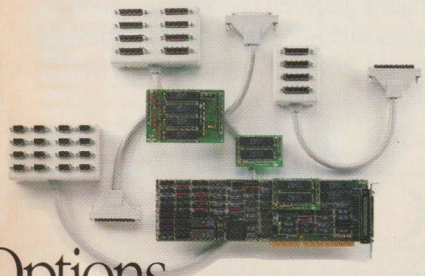
Multiplied Protection

We back our products with an uncompromising 30-day satisfaction guarantee, a *5 year warranty, complete technical support, and most importantly...a company that's easy to do business with. It all adds up to the best protection plan available. And if you're a VAR, call us about our Reseller Program that provides you with options designed exclusively for your needs.

30/5

*1 yr. MultiVision

for Multi-Users.



Options

Our products offer serial port and memory options that are field upgradable; compatibility with ISA (AT), MicroChannel and EISA buses; RS232, 422, 485 and Current Loop interfaces and DB 9, DB 25 and RJ 45 connectors.

Graphics

When your needs move beyond text, MultiVision moves into view--a high speed (100 megabits per second) communications controller that offers near instantaneous multiuser graphics like you've never seen before.

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